EMPLOYERS' EXPERIENCES WITH GRADUATES OF INDUSTRIAL SYSTEMS TECHNOLOGY COMMUNITY COLLEGE PROGRAMS IN NORTHEAST ALABAMA: A PHENOMENOLOGICAL STUDY

by

Todd Edwards Freshwater

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

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Abstract

The purpose of this phenomenological study was to understand what skills alignment gaps exist between graduates of Industrial Systems Technology CTE programs and local industrial employers. Career Technical Education is structured to develop students using practical experiences, which help students to develop the skills, both practical and soft, needed to work as technical career professionals. A phenomenological approach was used to structure this study. Phenomenological research is used to explore the shared meaning of a group of individuals that have the same experience, discovering differences and similarities between those experiences. The setting of this phenomenological study was the production and manufacturing industry located in Northeast Alabama that employs individuals, with technical degrees, from community colleges. Individual interviews and focus groups were used to explore the experiences of those who employ career technical graduates. The data obtained was prepared for data synthesis by preforming a thematic analysis, which is used to establish patterns or themes drawn from each participants' experiences, analyzing what the participant said during the individual interviews. Three themes emerged from the data that included skills deficiencies, technical degree perceptions, and changing technology. An examination of these themes revealed an expectation of skills deficiencies by employers, and an overall positive view of a community college education. CTE program instructors should meet with employers to determine current needs and prepare for changing technology. Future studies should be conducted to determine if employer experiences are similar in different types of industries.

Keywords: Career Technical Education, Experiential Learning, community college, soft skills, employer experiences

Copyright

Dedication

This dissertation is dedicated to my family, who have supported me through this process. To my wife Missy, you demonstrated the work and dedication it takes to complete a doctorate, and then supported me as I took the same journey. Without your example, love, and patience, I could not have completed this dissertation. To my children Serra and Emily-Kate, thank you both for your support and understanding. You were always encouraging, and that encouragement helped me continue to work, and overcome the frustrations that came with writing this dissertation. The love of one's family is more valuable than any degree or award that may be achieved in this world.

"For the Lord gives wisdom; from his mouth come knowledge and understanding." Proverbs 2:6

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"Plans are established by counsel. By wise counsel wage war." Proverbs 20:18

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List of Abbreviations

Alabama Community College System (ACCS)

Alabama State Department of Education (ALSDE)

American Psychological Association (APA)

Associate of Applied Science Degree (A.A.S.)

Career Technical Education (CTE)

Industrial Systems Technology (IST)

Institutional Review Board (IRB)

Occupational Health and Safety Administration (OSHA)

Personal Protective Equipment (PPE)

Secretary's Commission on Achieving Necessary Skills (SCANS)

Science, Technology, Engineering and Math (STEM)

United States (U.S.)

CHAPTER ONE: INTRODUCTION

Overview

The purpose of Career Technical Education (CTE) is to provide the tools and skills students need to begin working in a technical or industrial field. The majority of these programs are associate of applied science degrees (A.A.S) offered by community colleges. The goal of these programs is to provide local industry with graduates who meet the immediate needs of their employers (Sublett & Griffith, 2019). The purpose of this chapter is to explore the background of CTE and to discuss the study's problem and purpose statements. The significance of the study will also be discussed, and the research questions will be presented. Aligning CTE outcomes with industry needs is important to ensure that community colleges are producing students that are ready to enter the workforce (Gauthier, 2019).

Background

Community colleges, despite offering a variety of CTE programs, have traditionally viewed these programs as only appropriate for students that may not have the same academic skills as those students that pursue a traditional education (Gauthier, 2020a). Stereotypes associated with CTE programs view these careers pathways as best suited for students that are primarily male, often minorities, and lacking the skills and motivation needed to be considered for meaningful employment (Tucker & Hughes, 2020). These stereotypes are rooted in the experiences many educators and students had with traditional vocational education. Historically, there has been a stigma associated with vocational education, which viewed this pathway as inferior to traditional college education and is often associated with the industrial jobs of the past. Improvements in perceptions of CTE programs, deriving from better public relations,

federal funding and a name change, have lessened, but not removed the stigma of college level technical education (Malkus, 2019).

Despite improvements in the perception of CTE as a viable and desirable career pathway, issues with perceptions of community colleges, in general, still persist. Just as CTE programs are viewed as inferior career pathways, two-year institutions are also viewed as either a poor substitution for a four-year school or as a stepping stone to a four-year school that provides an opportunity to take the "basics." Further, most students that enroll in community colleges intend to continue to pursue additional educational opportunities, usually by transferring to a four-year institution (Gauthier, 2020a; Shaw et al., 2019). The purpose of this section is to provide a brief historical context of CTE, examine who is impacted by this issue, and present a brief summary of recent scholarship on this specific issue.

Historical Context

Issues with aligning CTE curriculum with the needs of the workplace and current teaching pedagogy are not new. Early vocational training, often referred to as manual training in the late 19th and early 20th centuries, was viewed as a way to provide students with real world skills that they could use for gainful employment. This focus on practical experience was an important change for United States (US) education that had previously depended on the traditional, Socratic method. This new teaching style, that proposed cooking classes for girls and woodworking classes for boys, was championed by intellectuals, such as Calvin Woodward, James H. Stout, and John Dewey (Alix, 2019). However, while this experiential style of learning was viewed as important, there was criticism that the students that participated in manual training were not receiving enough theoretical instruction and were not being properly educated (Payne, 1906; Kett, 2017).

CTE programs emphasize education as means to employment in a technical or craft field, and this goal helped to justify the emphasis on vocational and CTE education in the 20th century (Dougherty & Lombardi, 2016). However, despite an emphasis by both government and education institutions, there have been ongoing issues with the effectiveness of CTE curriculum and its alignment with employer needs. Grubb (1997) noted that community colleges need to provide job-specific education, connecting with business and industry to determine local needs. Rapid changes in the economy have required CTE programs to be responsive to new approaches to production and manufacturing. Technology and globalization require graduates that are prepared to immediately meet the needs of their employer, without requiring excessive amounts of remedial training (Rojewski, 2002).

To address changes in the production and manufacturing sector, and to create a pipeline of skilled technical workers, the State of Alabama introduced an expanded workforce development initiative designed to meet the current and future needs of industry employers. Introduced by Governor Kay Ivey in 2019, the *Strong Start, Strong Finish* program was designed to improve technical education opportunities that are applicable in real-world settings and provide skills that employers need to be competitive in a rapidly changing economic environment. As part of this initiative, the Alabama Office of Apprenticeship was created to oversees technical apprenticeship programs within the state, and manage the Alabama Community College System's (ACCS) partnership with the National Association of Manufacturers (The Office of Alabama Governor, 2019).

Alabama's technical education and training conceptual framework recognizes the need for interaction and input with local industry leaders. There is an expectation that CTE students will not only have access to current technology and relevant technical curriculum, but also have

access to laboratory exercises that are both traditional and non-traditional in nature. To assure that student training aligns with employer needs, the State of Alabama has created an advisory council that is to provide input regarding equipment, curriculum improvements, technical needs and updates, and necessary soft skills. The goal of Alabama's education and training conceptual framework is to create an education pathway that prepares students with the workplace-readiness skills needed to become successfully employed in a highly skilled, technical career (Alabama State Department of Education [ALSDE], 2022). It is important to note that advisory council minutes and recommendations are not found on the State of Alabama's CTE resource page. Information is available for technical plans of instruction, funding, national standards, and laboratory activities and supply lists, but the Advisory Council Handbook was last edited in 2013, and there are no references to past or upcoming meetings (Alabama State Department of Education [ALSDE], n.d.). The lack of information regarding employer needs, especially employer experiences with CTE graduates, underscores the need for research that fills the gaps in the resources available to administrators, instructors, and employers of CTE program graduates.

Social Context

Unfortunately, CTE programs have long been associated with low academic achieving students and lower quality curriculum standards (Xue et al., 2019). CTE programs are also often criticized for diverting students to two-year degree plans instead of promoting transfers to four-year institutions (Gauthier, 2019). Negative perceptions of CTE programs can impact the experiences of both students and employers, who have preconceptions of program quality and outcomes. Despite the high demand for CTE graduates in the workforce, most of these programs

are viewed as less desirable than a four-year degree and may be shunned by potential students (Kandalec Holm, 2019).

CTE programs provide an education that leads to employment in fields that are in demand. By demonstrating that CTE programs align with employer needs and by providing recommendations that will improve alignment, research in the area of employer experiences will help to remove the stigma of community colleges and CTE. Because CTE students usually do not intend to transfer to another school, they are often stigmatized with the assumption they do not have the motivation to complete their education (Gauthier, 2020a). Improvements in curriculum and academic standards will also help to remove this stigma and encourage students to pursue these degrees. By engaging all stakeholders, especially employers, program quality and outcomes can be examined and improved. Often teacher and employer understanding of what constitutes a quality education and what training is needed in the workplace do not match (Dicker et al., 2019).

A failure of alignment of CTE curriculums and employer needs has an impact on the employability of CTE graduates, perceptions of the community colleges that offer these programs, and the employer's ability to find qualified candidates to fill their vacant technical positions (McGunagle & Zizka, 2020; Gauthier, 2020b). Since employers and CTE instructors and administrators do not consistently collaborate on the best way to prepare students for the workforce, CTE instruction may not provide students with all the skills they need to prepare for an entry level job. Employer technical needs change rapidly, and CTE graduate employability is directly impacted if CTE programs do stay current with their instruction (Baird & Parayitam, 2019). The success of CTE programs is important to the U.S., both economically and socially.

Quality CTE programs lead to high quality job opportunities, improved financial gains, and reductions in families in poverty (Michaels & Barone, 2020).

Theoretical Context

CTE studies have traditionally focused on the learning pedagogies used by instructors and institutions to develop student skills and increase employability. While many different theoretical frameworks are used to develop these studies, a review of the literature shows that Constructivism (Chuang, 2021), Experiential Learning Theory (Bradberry & De Maio, 2018; Burch et al., 2019), The Human Capital Theory (Baird & Parayitam, 2019; Sublett & Tovar, 2021; Sweetland, 1996), and associated theories that fall within these broader categories, are consistently used. CTE researchers have consistently focused on the learner and the development of curriculum that provide students with the ability to obtain, maintain, and replace employment as required (Hillage & Pollard, 1998; McGunagle & Zizka, 2020). These theories have overlapping tenets that describe similar phenomenon, and some studies include two or more of these theories as the framework (Baird & Parayitam, 2019; Michaels & Barone, 2020).

Constructivism is often associated with cognitivism and is structurally similar to the experiential learning theory. Constructivism established that learners construct knowledge instead of passively learning what is presented to them. Learners process and construct new information by relating it to their experiences, and then filter that information by referencing their personal attitudes and beliefs. Instructors are facilitators instead of presenters, and the process is learner-centric, with the experiences of the learner influencing the processing of new information (Chuang, 2021; Garmston & Wellman, 1994; Vygotsky, 1978). Russian psychologist Lev Vygotsky's social development theory is the primary foundation of constructivism. According to Vygotsky (1978), social interactions come before cognitive

development and occurs best when learning follows social exchanges between individuals. Constructivism posits that a learner is in control of the learning process and that learning is most effective when a student can relate new knowledge to existing knowledge. This type of learning adds to the learner's framework of understanding (Clark, 2018).

There are five primary principles of constructivism. First, knowledge is constructed and is not passively absorbed. Learners build new knowledge based upon the foundation of previous learning. Second, learning is an active, not passive, process. Information can be received passively but understanding must be an active process. Third, all knowledge is socially constructed (Clark, 2018; Chuang, 2021). Vygotsky (1978) believed that community played a central role in the process of creating meaning, and environment will influence how individuals think and what they think about. Fourth, all knowledge is personal, and each individual has a distinctive point of view based on existing knowledge. Fifth, learning exists in the mind, and learners will constantly try to develop their own individual model of the world from their perceptions of the world (Clark, 2018; Vygotsky, 1978).

Experiential learning has been associated with career and technical education for many years and is a learning pedagogy that gives students the chance to acquire and apply knowledge in real world settings (Burch et al., 2019; Clark et al., 2010; Habib et al., 2021; Threeton, 2021). Experiential learning occurs as part of a four-stage cycle. First the learner is exposed to concrete experiences using simulations and demonstrations. Second, the learner reflects on the experiences through discussions. Third, abstract concepts are transferred, and fourth, decision-making skills are developed so new ideas gained from experiences may be used (Kolb, 1984; Kolb & Kolb, 2005). CTE programs use laboratory experiences, classroom instruction, and hands-on exercises to provide significant learning opportunities. Previous vocational programs

often trained students for basic, repetitive work, but today's technical training is focused on developing scaffold competencies that improve students' creative and critical thinking skills and broad, technical knowledge (Habib et al., 2021).

While experiential learning is commonly associated with CTE, constructivism, and its practice, also plays a role in student learning. CTE programs, such as Industrial Systems Technology, present students with a variety of disciplines that overlap and are integrated into single systems. The curriculum is designed for each course to support and relate to the programs' core classes. Constructivism is the connecting of existing information with new information, including the learner's experiences in this process (Clark, 2018). CTE instructors present the students with the information and theory they need to construct and/or discover the relationships between the program content and curriculum.

Human Capital Theory posits that individuals and society benefit economically from investments in individuals, which includes creating effective learning environments (Baird & Parayitam, 2019; Sweetland, 1996; Sublett & Tovar, 2021). Learners are not motivated by experience but instead view education in terms of benefit, weighing employability and wages against potential cost, such as tuition and time (Sublett & Tovar, 2021). The human capital approach creates employability by focusing of four major learning components. First, learners need assets, which are defined as knowledge, skills, and critical thinking. Second, students need to be marketable by possessing soft skills and job search skills. Third, students must be able to present themselves by being able to write cover letters and resumes. Finally, students must manage personal and external environments by prioritizing responsibilities and understanding the current job market (McGunagle & Zizka, 2020).

Human Capital Theory promotes education and skills development as an effective method to improve individuals, society, and, by extension, the economy (Baird & Parayitam, 2019). Constructivism, Experiential Learning, and the Human Capital Theory all provide learning pathways to developing skills that may lead to employability. However, it can be difficult to apply a specific theory to CTE learning. CTE research, while becoming more robust, is narrow in scope, which limits determining a consistent, foundational theory. Further, CTE is practice centric and not theoretical, making an academic agreement of the use of a specific theory more difficult (Michaels & Barone, 2020).

For this study, Experiential Learning Theory will be used because it best describes the type of learning that occurs in CTE programs. CTE is designed to educate students using practical experiences that help develop the skills needed to work as a technical career professional (Threeton, 2021). CTE programs that use experiential learning techniques help students develop skill competencies, improve critical thinking skills and use real-world laboratory activities to help students acquire and learn to use applicable knowledge (Habib et al., 2021). While constructivism and Human Capital Theory are also applicable frameworks, Experiential Learning Theory techniques are the most effective way for students to learn skills and develop the ability to apply knowledge in the workplace (Bradberry & De Maio, 2018; Burch et al., 2019; Habib et al., 2021; Morris, 2020; Mohammadi et al., 2020; Threeton, 2021).

Problem Statement

The problem is career technical instruction curriculum and training does not always align with the practical needs and technical requirements of local industry (Baird & Parayitam, 2019; Gauthier, 2020b; Giani, 2019). Employers are looking for employees who are ready to integrate into the workplace and demonstrate skills and competencies that are usually obtained by

candidates who have recently graduated from a technical two-year degree program (Gauthier, 2020b). Baird and Parayitam (2019) noted that surveys of employers that hire new CTE graduates state that recent graduates tend to lack technical skills and work experience but often are competent in soft skills and general work functions. Despite the need for students to be fully prepared to enter the workforce, college programs are still using traditional curriculums, which do not align with the needs of today's employers (McGunagle & Zizka, 2020). Since employers need employees that are technically competent, there is a skills and curriculum alignment gap between graduates and employers, which should be addressed by the community colleges that promote these graduates as technically ready for employment (Wrye et al., 2019). A primary gap in the literature is that, while there are many studies on what employers perceive to be skills needed for graduates to be employable, there are few studies that examine employer experiences with CTE graduates that are hired (Baird & Parayitam, 2019; McGunagle & Zizka, 2020). Since CTE programs have become federally incentivized and community colleges are receiving enhanced funding for these programs, determining what alignment gaps are occurring is critical to improving the quality of these programs (Baird & Parayitam, 2019; Giani, 2019). Community colleges will find it necessary to address the needs of their industry partners and align curriculums based on local needs (Atwell et al., 2022).

Purpose Statement

The purpose of this phenomenological study is to examine what skills alignment gaps exist between graduates of Industrial Systems Technology CTE programs and local industrial employers. Each employer in this study will be experiencing the process of hiring a new employee and integrating them into their working environment. These employers have expectations and preconceptions of what it means to be prepared for a technical position. This

study will examine the reality of what they experience. At this stage in the research, skills alignment gaps will be generally defined as the inability of CTE graduates to meet the technical skill needs of local employers.

Significance of the Study

This study will provide CTE employers the opportunity to share their experiences with graduates of a regional Industrial Systems Technology program. Employer experiences are defined as the interactions, observations, and dialogues these employers have with program graduates. An exploration of these experiences will develop themes that will provide insight into issues with the alignment of program curriculums, teaching pedagogy, and the needs of industrial employers. By meeting these needs and improving alignment, CTE community college programs will improve student outcomes by providing employers work-ready employees that will have an immediate, positive impact on the employer's financial and production goals.

Employers expect new community college graduates to have mastered skills specific to their craft and be able to demonstrate those skills immediately after being hired. Employers, while valuing a CTE degree, do not see completion of a CTE program as a guarantee of the ability to deploy practical skills. Employee quality and value is determined by demonstrated skills and performance on the job (Gauthier, 2020d). There is extensive research on employer expectations of technical program graduates but very little on the experiences these employers have with their new employees and how these experiences align with their expectations. This study is significant because it will provide themes and insights that may assist CTE curriculum designers and instructors in producing students with the skills that employers want and need.

Theoretical

Experiential learning is usually associated with CTE programs and is a learning style that provides students with the opportunity to acquire and apply knowledge in a real-world setting (Clark et al., 2010). Learning cannot take place without experience and genuine education is a result of the individual's interpretation of practical experiences (Morris, 2020). Kolb (1984) theorized that personal experiences are the point where learning occurs. CTE curriculums use traditional lecture, laboratory exercises, and collaborative activities to provide opportunities to develop practical skills. By using scaffolding techniques, creative, critical thinking, and technical skills are developed (Habib et al., 2021). This study's evaluation of CTE graduate employability will also help to evaluate the effectiveness of the experiential learning model for technical programs. CTE programs are dependent on experiential curriculums, and it is important to evaluate student learning outcomes using this model (Gauthier, 2020b).

Empirical

The value of community college CTE programs is contingent on the quality and technical aptitude of the program's graduates. Defining what constitutes a quality education can be difficult. Often employers emphasize the need for experience over education (Gauthier, 2020b). Since experience is a priority for previously surveyed employers, research could include a discussion on how to combine experience and theoretical learning in CTE programs and curriculums. Hollister et al. (2017) noted that there is a need for research relating to employer perceptions of workplace readiness and employability. Interviewing employers in proximity to their specific community college will contribute to this need and provide data that would be applicable to community colleges offering CTE programs that are outside of the study area. There is a gap in the research between employer expectations and CTE instructor/curriculum

priorities (Wrye et al., 2019). This study contributes to the literature on this topic by determining specific issues contributing to this gap.

Practical

Traditionally, the purpose of CTE programs has been to prepare students for basic, entry level jobs. However, the complexity of today's technical career needs has created a demand for highly skilled employees. Employers are no longer seeking graduates with only job-ready skills but instead, are seeking graduates that are multi-dimensional with communication, technical, social, and readiness for complex assignments, without the need for remedial, on-the-job training (Gauthier, 2019). Instructor and employer expectations of what skills are needed in the workplace may greatly differ. If there is a gap in these expectations and employer experiences with CTE graduates are negative, then there will be a negative impact on student employment and post-secondary programs (Dicker et al., 2019). To successfully meet the needs of today's job market, CTE programs must be in alignment with the needs and expectations of employers. Further, these programs must be responsive and able to adapt to rapidly changing technology to provide students with current applications (Sublett & Tovar, 2021). Interviews and focus groups will be conducted with employers that are in the same community as the school that is offering CTE programs. By exploring employer experiences, these schools will be able to understand what the needs of their community are and be equipped to evaluate their curriculums for relevance and effectiveness (Gauthier, 2021).

Research Questions

The following questions will guide this study.

Central Research Question

How do employers of graduates of Industrial Systems Technology programs describe their experiences with these new employees?

Sub-Question One

How do employers of Industrial Systems Technology graduates determine new employee skills gaps?

Sub-Question Two

How do employers fill in new employee skills gaps?

Sub-Question Three

What is the employer's perception of the effectiveness of CTE college programs?

Definitions

1. *Registered Apprenticeship*-a career pathway that is high-quality, industry-driven, provides employers a process to develop a future workforce and allows individuals to obtain paid work experience, wage increase, classroom instruction, and a nationally recognized credential (United States Government, n.d.).
2. *Career Technical Education*- technical education offered primarily by community colleges designed to prepare graduates to enter the workforce as a skilled, craft laborer (Sublett & Tovar, 2021).
3. *Industrial Employer* – a manufacturing or material production entity who seeks to employ individuals with technical knowledge or skill and/or graduates of Career Technical Programs (Gauthier, 2020b).

4. *Skills*- the ability to perform a specific task or job and possess the knowledge and work habits needed to support that ability (Alic, 2018; McGunagle & Zizka, 2020).
5. *STEM*-a multidisciplinary approach to education designed to enhance economic and global competitive challenges by focusing on science, technology, engineering, and math, especially in K-12 education (Eckert & Butler, 2021; U.S. Department of Education, n.d.).
6. *Technical Skills*- the ability to perform a particular, technically oriented task or job, and the ability to take these skills and transfer them to another task, as needed by the employer (Alic, 2022; Baird & Parayitam, 2019; McGunagle & Zizka, 2020).
7. *Vocational Education* – the precursor to Career Technical Education, developing in the middle of the 19th century and focused on preparing students for entering the workforce (Giani, 2019).

Summary

Much of the research on the effectiveness of CTE programs focuses on student satisfaction with program outcomes and the percentage of placement of new graduates. Employer definitions of competence are often different than those of CTE program instructors and administrators (Gauthier, 2020b). There is a need for further qualitative research that focuses on the experiences of employers who employ CTE graduates and their perceptions of the level of competency of CTE program students (Hollister et al., 2017). If CTE programs are going to be relevant and successful, CTE academic policy decisions must be aligned with labor market needs and requirements (Sublett & Tovar, 2021). By using interviews and focus groups, employer feedback, experiences and recommendations can be explored and shared with all stakeholders. Since there is still a stigma associated with CTE programs and the community

college system, it is important to determine if employer experiences with these programs are contributing to this stigma. This qualitative study is designed to contribute to the literature that demonstrates that gaps exist between CTE program curriculum, and the needs of employers who hire CTE graduates.

CHAPTER TWO: LITERATURE REVIEW

Overview

A systematic review of the literature was conducted to explore employer experiences with graduates of Career Technical Education (CTE) programs. In the first section, Kolb's Experiential Learning Theory will be discussed, which will be the theoretical framework that will guide this study. A synthesis of recent literature will then be examined including a history of the evolution of CTE and vocational education, experiential learning and CTE, perceptions of CTE from within the community college system and the community at large, experiential learning and its application in technical education, curriculum alignment, including simulations and apprenticeship, needed skills for the 21st century workplace, and teacher quality and preparation for teaching CTE. Lastly, employer perspectives will be examined, demonstrating that the literature does not effectively explore employers' experiences with CTE programs, and that this gap in the literature demonstrates a need for the current study.

Theoretical Framework

The theoretical framework that guides this study is Kolb's Theory of Experiential Learning (Kolb, 1984). Career Technical Education is structured to develop students using practical experiences, which help students to develop the skills, both practical and soft, needed to work as technical career professionals (Threeton, 2021). Experiential theories posit that learning is constructed by the student through experience and active engagement. Active learning methods are considered to be more effective than traditional learning methods that depend on lecture and repetition to reinforce learning concepts (Bradberry & De Maio, 2018; Burch et al., 2019; Habib et al., 2021; Morris, 2020; Threeton, 2021). This section examines this theory and its relevance to CTE pedagogy.

Theory of Experiential Learning

Experiential learning is an active, rather than passive, learning process that encourages students to learn by doing, then reflecting on the results of their actions. Knowledge comes from a combination of processes that includes acquiring abstract concepts and then applying them to different situations. Learning comes from first grasping a concept, and then having a transformational experience to reinforce that concept. This learning process occurs over four stages, depicted in Image 1. The first stage is concrete experience, which is when the learner encounters a new experience or situation. This stage also includes opportunities to reinterpret existing experience. The second stage consists of reflective observation. During this stage, the learner reviews and reflects on the experience. Third is abstract conceptualization. At this stage, the learner makes conclusions and learns from the experience. The final stage, active experimentation, is when the learner applies what they have learned through a related activity (Kolb, 1984).

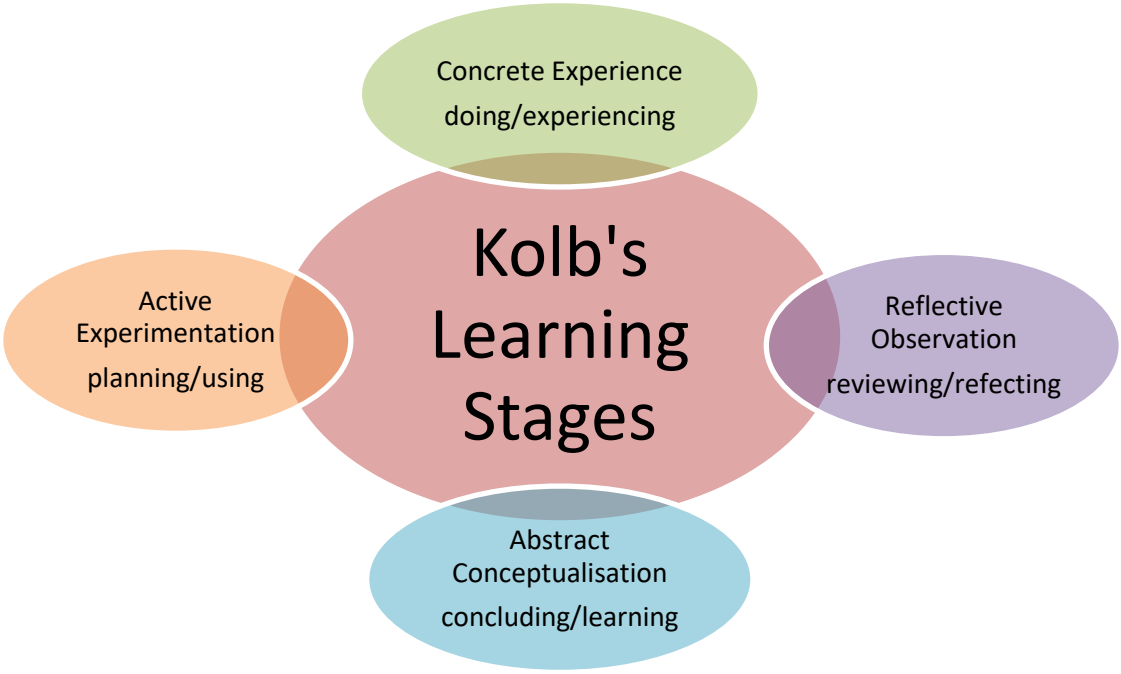
Learning cannot take place without experience, and genuine education is a result of the individual's interpretation of practical experiences (Kolb, 1984; Morris, 2020). Kolb (1984) theorized that interactive, personal experiences serve as a focal point for learning. Experience alone, however, does not complete the learning process. Students must also have time to reflect on the experience until they can make associations that allow them to relate each experience to a previous experience. The process concludes when the student creates abstract links that allow them to determine how they will apply the experiences to future situations (Kolb, 1984).

When creating experiences, an individual's learning styles should also be evaluated. According to Kolb (1984) there are four distinct learning styles, and a student's learning style may be influenced by outside influences, such as social environment, educational experiences,

and the cognitive structure of the individual. The first learning style is diverging. These individuals are able to look at experiences from different perspectives. They would rather watch than do and use information gathering to solve problems. The second style is assimilating, which includes learners that use a logical approach to problem solving. The third style is accommodating, which includes learners that use a 'hands-on' approach and intuition for problem solving. The fourth approach, converging, consists of learners that solve problems and use their experiences/learning to find solutions to practical problems (Kolb, 1984; Kolb & Kolb, 2005). Kolb's experiential learning cycle and learning styles models remain very influential and are often cited as the clearest expression of the experiential learning theory (Morris, 2020).

Figure 1

Kolb's Stages of Learning



Note: Summarizes Kolb's Experiential Learning Theory Stages (Kolb,1984).

Experiential Learning and CTE

CTE and STEM learning programs are designed to help students learn skills and develop the ability to apply knowledge to real-world situations found in technical career fields (Threeton, 2021). In a 1991 report, that sought to predict the skills needed by employers in the 21st century, the United States (U.S.) department of Labor formed the Secretary's Commission on Achieving Necessary Skills (SCANS). The SCANS report noted that, for people to succeed in the future workforce, schools would need to change or improve their pedagogy in three key areas. First, they would need to be able to teach students how to join knowledge and skills. Second, they would need to teach abstract concepts by engaging in hands-on practical activities and third, schoolwork would need to be connected to the real world, in a practical instead of abstract manner (Mohammadi et al., 2020; U.S Department of Labor, 1991). The goals of SCANS align with the use of experiential learning, which is usually viewed as a more effective method of teaching than traditional lecture because it develops problem solving skills and teaches how to apply knowledge to specific situations (Bradberry & De Maio, 2018).

Experiential learning is an effective way to create learning pathways that give the students the skills they need to be ready to enter the workforce. By helping students to learn to merge concrete experiences with abstract concepts, experiential learning uses new experiences to create knowledge (Kolb, 1984; Kolb & Kolb, 2005). CTE programs that employ experiential learning techniques and methodologies help students develop competencies, improve creative and critical thinking skills, and use hands-on experience to help students acquire practical and applicable knowledge (Habib et al., 2021). Today's employers note that they have difficulty hiring qualified workers to fill open positions. Often, the issue is not credentialing but the ability to apply the knowledge that the individual is purported to have learned (Alic, 2018; Koehorst et

al., 2021). Experiential learning is designed to help students take experiences and link those experiences to prior experiences until the student can determine how they will use those experiences in future situations (Burch et al., 2019; Kolb 1984; Kolb & Kolb, 2005). While experiential learning is consistently associated with CTE programs, curriculum developers cannot use it to determine which parts of the curriculum properly align with the needs of local industry. Without proper alignment and an exploration of employer needs and experiences with CTE programs, experiential learning-based programs may be effectively teaching skills that are not needed or applicable to real-world, technical employment.

Related Literature

There is extensive research on the history of Career Technical Education and its evolution from 19th century vocational education to today's more academically rigorous, degreed programs. In the past, technical education was viewed as a way for low achievers to learn a trade (Xue et al., 2019). Despite negative perceptions, CTE has been a reliable pathway to mid-level, skilled jobs, and a means to enter the economic middle class (Haviland & Robbins, 2021). Today, perceptions are changing, and CTE is viewed as a viable, low-cost way to provide a sound career path for a variety of students, not just those that may struggle with post-secondary academics. There is now an emphasis on creating a positive view of CTE programs, providing program access to all students, and assuring that CTE curriculums align with employer needs. This section examines the history of Career Technical Education, program perceptions, and the need for additional studies to determine if the programs are providing the type of education needed for students to enter the workforce.

Career Technical Education

Career Technical Education (CTE) is designed to assist students from a variety of socio-economic backgrounds and ages achieve a postsecondary education and attain a stable career without a bachelor's degree (Cho-Baker et al., 2021). CTE is usually associated with the community college system, which offers a variety of career and technical programs. Community colleges often have relationships with local industry and are best suited to understand the needs of local employers (Atwell et al., 2022). These programs are designed to meet the needs of specific industries by equipping students with the skills they need to obtain employment in a technical field (Gauthier, 2019). In the past, CTE has been perceived as a lesser academic track and designed for lower performing students. However, as the need for technically skilled employees has increased, CTE curriculum has become more rigorous and grounded, covering at least 16 career clusters, including agriculture, architecture, hospitality, business, communications, health science, and STEM (Xue et al., 2019).

Historical Context

Vocational education can be traced back to the middle of the 19th century, with technical education becoming more prominent in the 20th century, as rapid industrialization created a need for skilled students who were prepared to enter the workforce (Atwell et al., 2022a; Giani, 2019). Prior to the 20th century, students were provided manual training, which emphasized learning how things were done, instead of theory that examined why they were done (Payne, 1906). In the early 1900s vocational education curriculums in the United States were designed to provide students the skills they needed that would improve employment opportunities and provide a workforce that would continue to drive American manufacturing into the next century (Michaels & Barone, 2020). Initial CTE proposals emphasized learning skills that were related to

agriculture, homemaking, and industrial training. Social and cultural changes after the World War I prompted the federal government to evaluate the effectiveness of vocational education and prompted over a century of vocational and CTE legislation and regulation (Cho-Baker et al., 2021; Kim et al., 2021).

Government interest and influence in vocational education can be examined in four stages, which are presented in Table 1. Each stage tracks the evolution of federal legislation, as it changes and adapts to current economic trends and needs of industry. Stage 1, pre-twentieth century vocational education, is the formative period of American vocational education, with roots in the manual training movement. Stage 2, vocational to career and technical education, becoming the first significant legislation proposed after World War I, designed to prepare children for a career that did not require post-secondary education, and included training in agriculture, home economics, and the industrial trades. Stage 3, the new vocationalism, contains the legislation that began the shift from traditional vocational education to an emphasis on higher level learning skills, changes to target demographics and an emphasis on equity. Stage 4, CTE moves from labor to education policy, contains the legislation that changes the vocational education label to CTE and an emphasis on a robust CTE curriculum that aligns with employer needs and further emphasis on equity within CTE programs (Blissett, 2020; Kim et al., 2021; Plasman et al., 2020).

Table 1

Timeline of U.S. federal vocational, career and technical education legislation

Stage 1: Pre-Twentieth century vocational education	
1800's	The Manual Training Movement
1862	The Morrill Act

Stage 2: Vocational to career and technical education	
1917	Smith-Hughes National Vocational Education Act
1963	Vocational Education Act
1968	Amendment to the Vocational Education Act
Stage 3: Vocationalism	
1984	Carl D. Perkins Vocational and Technical Education Act (Perkins I), a reauthorization and renaming of the Vocational Education Act
1990	Carl D. Perkins Vocational and Applied Technology Act (Perkins II) establishes Federal vision for the new vocationalism that includes curriculum alignment between Secondary and postsecondary institutions
1998	Carl D. Perkins Career and Technical Education Act (Perkins III) a renaming and reauthorization of Perkins II
1998	Workforce Investment Act
Stage 4: CTE focus moves from labor to education policy	
2006	Reauthorization of the Carl D. Perkins Career and Technical Education Act (Perkins IV)
2011	Trade Adjustment Assistance Community College and Career Training Act
2015	Reauthorization of the Elementary and Secondary Education Act (Every Student Succeeds Act) which includes CTE as part of a well-rounded education
2018	Strengthening Career and Technical Education for the 21st Century Act (Perkins V)

Note: This table highlights the significant federal legislation related to CTE since the late 1800's to the present. Further, each state and region may have its own policies and approaches to CTE that enhance or overlap federal programs. Differences in these programs can make tracking CTE outcomes and effectiveness difficult (Snell, 2019). Adapted from "Equity in secondary career and technical education in the United States: A theoretical framework and systematic literature review," by E.H. Kim, C. Flack, K. Parham, and P Wohlstetter, 2021, *Review of Educational Research, 91*(3), 356–396.

The Morrill Act

Debate on whether theory or practice in industrial education should be emphasized in the training of students in vocational pursuits is not new (Kett, 2017). The manual training movement of the late 1800's was rooted in the apprenticeship programs so common to Europe and the English colonies in the Americas in the 1600's to the late 1800's. This manual training movement emphasized the need for organized, effective training for boys that would find employment in semi-skilled to skilled jobs that did not require a college degree. The goals of the movement included combining both theory and practice, teaching methods that emphasized thinking as well as doing, and developing the ability to identify causal relationships, improving student judgement and reasoning (O'Banion, 2018; Payne, 1906). The manual training movement was not without debate, with arguments over whether apprenticeship and workforce training should take place within or outside of school and answer the question of what was the purpose of the education (Hodge et al., 2020).

A forerunner to modern vocational education, the Morrill Act, also known as the Land Grant College Act of 1862, had the stated goal of providing practical education to the agricultural and industrial classes (Kett, 2017). Through the Morrill Act, congress donated public lands to both states and territories to create the first land-grant applied science colleges. The act was a response to changing economic forces and reflected a shift from classical education to specialized institutions that focused on applied science, mechanical arts education, and agriculture (Alexander, 2020). There was debate, however, as to which segment of the population should be directed to vocational training. Rapid growth in the cities, and lobbying by businesses and industry, bolstered the argument that vocational training was necessary to provide employee training for future manual and technical positions (Hodge et al., 2020; O'Banion, 2018).

The Smith Hughes Act

The need for skilled workers to drive economic growth created wide support for vocational education. Organizations, such as the National Association of Manufacturers, noted that European countries, Germany specifically, were growing as an industrial rival, and America's lack of skilled labor was impacting the ability of domestic companies to compete competitively in the world economy. Additional interest in vocational education came from farm groups, labor leaders, and feminists who viewed trade training as a way to increase the employability of women (Dougherty & Lombardi, 2016; Kett, 2017). Continued pressure from these groups, especially from the industrial sector, and post-World War I social-economic changes, influenced the federal government to expand its influence and support of vocational education (Dougherty & Lombardi, 2016; Kim et al., 2021; Plasman et al., 2020; Rojewski, 2002).

The first significant federal program designed to promote vocational education was the Smith-Hughes Act of 1917 (Blissett, 2020; Hodge et al., 2020; Kim et al., 2021; O'Banion, 2018; Rojewski, 2002). The program was designed to train individuals in jobs that, usually, did not require a college education but did require at least some technical training and instruction (Blissett, 2020; Cho-Baker et al., 2021). The curricula associated with the Smith-Hughes Act included emphasis on areas, such as agriculture, homemaking, and industrial focused training, being designed to prepare youth who were less likely to pursue postsecondary education, guiding them towards employment in factories, farms, and similar fields (Cho-Baker et al., 2021).

The Smith-Hughes Act's success can also be attributed to its alignment with early 20th century education reformers. John Dewey's educational theory included the use of work-based learning, using real-world experiences to reinforce content (Dewey, 2018; Dougherty & Lombardi, 2016). Dewey was concerned, however, that vocational education, as defined by the

Smith-Hughes Act, would lead to students going to work before completing at least 16 years of compulsorily education (Kett, 2017). Even at this early point in the history of vocational education there was conflict regarding the definition of education. Dewey viewed education as a means to provide for the development of the individual, who would then contribute to a democratic society. In contrast, other scholars viewed education as a means to provide for the needs of the workforce and employers (Dewey, 2018; Dougherty & Lombardi, 2016). Ultimately, Dewey believed that the law was too narrow in scope, emphasizing trade training over true industrial education (Kett, 2017). The tension between the needs of the worker and the needs of employers continues to be an issue in CTE program approaches and philosophies.

The Carl D. Perkins Acts

The next three primary legislative and funding measures to influence vocational education were the Vocational Education Act of 1963, which expanded the list of potential occupational paths that would be funded, and the 1968 amendment to the Vocational Education Act that expanded vocational training opportunities to the community college system (Haviland & Robbins, 2021). However, the Perkins Act of 1984 would have the biggest impact on delivery of modern vocational education. Originally titled the Carl D. Perkins Vocational and Technical Education Act, the Perkins Act was an expansion of the 1963 Vocational Education Act. The Perkins Act was structured to be the primary federal law that set the parameters for the development and support of technical education programs at the secondary and post-secondary institutional level (Granovskiy, 2018; Kim et al., 2021; Malkus, 2019).

The Perkins Act of 1990, known as Perkins II, proposed a new vocationalism that solidified the concept of career and technical education, being designed to expose students to a broad and robust curriculum, not just provide training for a specific, entry level job. The Act also required secondary and postsecondary CTE programs to be in alignment (Kim et al., 2021). In

addition to requirements to improve academic rigor within CTE programs, Perkins II also created new accountability requirements designed to improve alignment between academic offerings and the needs of business and employers (Malkus, 2019). A significant change in Perkins II was the introduction of Tech Prep initiatives that provided funding to schools that offered technical studies at the high school level, being followed by 2 years of postsecondary education, with students graduating with an associate's degree or a 2-year certification (Giani, 2019).

The 2006 Pekins Act, Perkins IV, was highly significant because it redefined the construct of vocational education to include fields that, in the past, may have been associated with associate or bachelor's degrees. Further, CTE programs of study were required to include coherent, rigorous, and challenging academic standards that included relevant and applicable technical content (Giani, 2019; Perkins IV, 122(c)(1)(A); Plasman et al., 2020). The addition of other career fields, an expanded definition what encompasses vocational education, and the belief by some that the term *vocational* was outdated and derogatory led to renaming the program Career and Technical Education (Blissett, 2020; Michaels & Barone, 2020). Besides removing the stigma that associated with vocational studies, referring to technical studies as CTE acknowledged that the curriculum for these programs was not only hands-on, labor oriented, but also acknowledged the shift to a more technologically oriented, service-focused work force that involved multiple career pathways and not an assignment to a single, entry level job (Hodge et al., 2020).

This change of focus and priority led to a restructure of CTE programs that included a robust and cohesive curriculum, and content designed to provide challenging academic standards and quality career and technical content (Giani, 2019). These modifications to the traditional vocational format had several implications in career technical education. First, CTE programs

were to be open to all students regardless of their academic ability or career aspirations. Second, CTE was to be connected to baccalaureate and postsecondary programs, not simply a conduit to the labor market. Third, since CTE now covered a diversity of subjects and career paths, it was important to determine how specific areas of concentration effect student outcomes and labor experiences (Giani, 2019). Perkins IV also sought to improve inclusion by noting the importance of expanding CTE opportunities to students who had been traditionally underrepresented in STEM programs, including females and students with disabilities. The legislation specifically noted that the Perkins reauthorization was designed to prepare all students, including special populations, for employment in highly skilled, technical jobs (Plasman et al., 2020).

Strengthening Career and Technical Education for the 21st Century Act

The most recent addition to CTE legislation, at the Federal Level, is the Strengthening Career and Technical Education for the 21st Century act, also known as Perkins V. The Act contains five primary goals that either reinforce or add to the original Perkins legislation that specifies how a CTE sequence of courses should benefit both students and technical employers (Granovskiy, 2018; Haviland & Robbins, 2021). First, CTE programs must provide students with technical and academic training that is both rigorous and current, so students will possess the skills needed to pursue careers in technical professions that are current or emerging. Second, CTE programs must provide demonstrable technical proficiency or a recognized post-secondary credential, which includes certificates or an associate degree. Third, CTE programs should include competency-based, work-based, or other experiential learning platforms that helps students to develop academic knowledge, critical thinking skills, interpersonal or soft-skills, technical skills, and any other skills relevant to understanding the expectations or needs of a specific industry or career path. Fourth, there should be coordination and cooperation between secondary and post-secondary education programs that allows students to access dual enrollment

programs and early college access. Finally, CTE programs at all levels should provide an opportunity for career exploration at the high school and middle school level to introduce students to the opportunities CTE provides (Granovskiy, 2018; Haviland & Robbins, 2021). These five goals were designed to address the perceived skills gap between students and emerging 21st century technology. The focus on the continuously expanding need for technical skills demonstrates that, if today's students wish to participate in the current economy, they must have skills that match employer needs (Blissett, 2020).

Perkins V also focuses on accountability of CTE programs that are using federal funds. Programs are to be evaluated in six primary areas. First, federal accountability requirements are to be compared to program funding and outcomes. Second, CTE programs are to be aligned with the needs of local labor markets. Third, program size, scope, and quality are to be evaluated. Fourth, documented progress towards CTE program implementation and alignment should be evident. Fifth, recruitment and retention of quality staff should be a priority. Training of CTE staff should also be evaluated. Finally, CTE programs should demonstrate progress towards providing access and equality for all students (Imperatore, 2020). The new accountability requirements of Perkins V were in conjunction with a shift of responsibility from the federal government to the state. This flexibility allows states to choose a measurement that may be used to reflect program quality and progress. States may choose from (1) the percentage of STEM students who graduate high school with a recognized postsecondary credential, (2) the percentage who earn dual credit as part of a dual enrollment program that is CTE focused, and (3) the percentage who participate in work-based learning programs, such as apprenticeships. States must also report on student progress by subgroups to track the involvement of underserved populations in CTE programs (Malkus, 2019).

The Significance of the Perkins Acts

As manufacturing and agricultural jobs decreased in the latter part of the 20th century, interest and enrollment in vocational education programs declined. The long-standing purpose of vocational education, the promotion of hands-on, entry level training in fields, such as agriculture, homemaking, and semi-skilled to skilled industrial labor, was no longer relevant (Snell, 2019; Cho-Baker et al., 2021). Replacing CTE and vocational education was the "college for all" movement that posited that, to be successful economically, it was necessary to have a four-year degree. Vocational education was viewed as a secondary and lesser pathway to a successful career (Giani, 2019; Kim et al., 2021; Malkus, 2019).

The shift away from technical and STEM training has created what is now referred to as a 21st century skills gap. A skills gap refers to a graduate's inability to contribute to the technological workplace, and failure to obtain the skills needed to participate in today's modern economy (Blissett, 2020). The Perkin's Act, with its iterations, was designed to bring vocational education back into the mainstream of education by focusing on STEM subjects, rebranding (vocational education to CTE), and by providing the funding needed to create CTE career pathways (Blissett, 2020; Haviland & Robbins, 2021; Hodge et al., 2020; Malkus 2019). The modern economy needs skilled workers to meet the needs of today's technically oriented businesses (Michaels & Barone, 2020). However, CTE programs will not meet this need if the skills being taught do not align with the employer needs and expectations.

Perceptions of CTE

Career Technical Education has historically been associated with low academic achieving students that were not suited for a rigorous academic education (Xue et al., 2019). CTE programs have also been criticized for diverting students from traditional four-year intuitions by emphasizing two-year degree plans (Gauthier, 2019). Negative perceptions of CTE often come

from within the intuitions that offer these programs. Non-CTE faculty often view technical programs as inferior to traditional liberal arts programs, and community college administrators may not understand the purpose of technical programs in light of the institution's goal of facilitating the transfer of enrolled students to four-year institutions (Gauthier, 2019). Despite the high demand for CTE graduates in the workforce, these programs are still viewed as less prestigious than four-year programs that provide less earning potential after graduation (Kandalec Holm, 2019), and one of the biggest obstacles to the growth of CTE programs and enrollment is the ongoing, negative perception of CTE programs (Russell & White, 2020).

Community College Stigma

The majority of CTE programs are provided by local community colleges, and perceptions of the quality of a community college education can influence perceptions of the quality of CTE programs. The majority of community college students state that their higher educational goal was to earn a bachelor's degree or higher (Shaw et al., 2019). The belief that community college is just a stepping-stone to a legitimate degree has created a stigma that is associated with those whose educational plan is limited to a community college two-year degree. Because CTE students do not intend to transfer to a four-year institution, they are stigmatized with the assumption that they do not have the ability to participate in the civic purpose of education, which is the pursuit of advanced degrees (Gauthier, 2020a). The belief that community colleges are not as academically challenging as four-year institutions is often held by members of the local community and employers (Shaw et al., 2019). The stigma of a community college education may influence employer experiences with graduates of CTE programs due to the perception that community colleges provide a lower quality and less rigorous education (Gauthier, 2020a).

Defining a Quality Education

While community colleges are stigmatized as institutions that do not provide a quality education, what constitutes a quality education is difficult to define. When considering CTE programs, quality would be defined by three major stakeholders: teachers, students, and employers. Dicker et al. (2019) noted that teacher understanding of education quality will likely not match their students or employer expectations. Teachers tend to view quality in terms of curriculum and graduation rates, while employers emphasize employability. Students, however, believe that a quality education begins with faculty that care about them and are invested in their academic success (Dicker et al., 2019). Understanding the relationship between these stakeholders, and their individual needs, will help community colleges change the perception that their programs do not provide a quality education (Gauthier, 2020a).

STEM

Education's interest in improving technical learning outcomes of students in the U.S. is not new. In the last decade, a focus on 21st Century Skills has led to an emphasis on teaching science, technology, engineering, and math (STEM) in K-12 classrooms (McComas & Burgin, 2020; McGunagle & Zizka, 2020; U.S. Department of Education, n.d.). The purpose of STEM curriculum is to prepare students to enter the technical workplace by developing problem solving skills, the ability to interpret information, and by teaching students to gather and evaluate information in order to make an effective decision (McGunagle & Zizka, 2020; (U.S. Department of Education, n.d.).

STEM education is closely associated with CTE because STEM course work at the secondary education level often leads students to pursue a post-secondary technical degree (Dougherty & Macdonald, 2019). STEM's association with 21st century skills, which refers to

mastering an expanded knowledge base, work habits, and character traits, which enhance employability and its relationship with post-secondary CTE programs, makes it necessary to evaluate if STEM curriculum benefits those students that are either entering the workplace or pursuing additional education and the community college level or at a four-year institution. There is, however, disagreement on what defines quality STEM education and how STEM programs should be implemented (Eckert & Butler, 2021; McComas & Burgin, 2020).

STEM is often touted as a beneficial way to increase student technical knowledge, but these benefits are usually expressed without citing current, broad research to support the claim. Further, research on the benefits of STEM often begin with the premise that STEM is beneficial and should be implemented without evaluation of its effectiveness (McComas & Burgin, 2020). There are several reasons that STEM education is uneven in its approach and effectiveness. First, many secondary STEM teachers do not have the technical background to implement a STEM pedagogy. Teacher comfort with technical fields, such as engineering, directly impacts their belief that they were qualified or prepared to teach STEM curriculum. Second, teachers lack the preparation time and professional development necessary to present an effective STEM curriculum. Further, teachers also noted that there was not enough classroom time allotted for STEM content. Third, teachers report a lack of resources to effectively teach STEM content. Since STEM is a technically robust curriculum, there is a need for access to computers and current technology needed to teach and present relevant technical activities. Finally, since STEM encompasses four different disciplines, teachers did not feel they were prepared or trained to teach a multi-technical curriculum. Teachers that were comfortable with one or two STEM elements felt uncomfortable teaching areas that were outside their area of expertise or training (Eckert & Butler, 2021).

CTE is designed to prepare students for professional employment and/or the pursuit of additional training opportunities. Today CTE is also emphasizing the need for 21st century skills as part of the curriculum. There is a connection between CTE and STEM in the U.S. (Dougherty & Macdonald, 2019). At the national level, STEM education initiatives have received extensive funding. In 2010, for example, the Obama administration proposed legislation with the goal to create 1,000 new STEM focused schools, employ and equip an additional 100,000 STEM educators, and improve STEM learning outcomes (The White House, 2016).

Because community college CTE programs are becoming closely associated with STEM education, in many cases CTE and STEM are interchangeable terminology, it is important to ensure that STEM curriculums are providing students with skills that they actually need to move forward academically. Students have reported significant gaps between what they learned in STEM institutions and what skills they needed in the workplace. Employers also report that STEM graduates have skills that may be highly regarded in academia but are not applicable or a priority for the workplace (McComas & Burgin, 2020; McGunagle & Zizka, 2020). Since CTE and STEM curriculums are closely related, and the same issues that impact effective STEM programs can also affect community college CTE programs, it is important to evaluate STEM teaching and curriculum at the K-12 grade levels and determine its relevance and effectiveness.

Credentials

CTE credentials are used to align students, both graduates of degree programs and those who have earned focused certifications, with employers. Credentials are used to demonstrate that the student or individual has demonstrated technical proficiency and skills that are related to a specific job function (Dalton et al., 2021). Employers are seeking employees that have employable skills, and they expect graduates and certified individuals to be able to demonstrate

those skills immediately after they are hired. Credentials demonstrate employability skills, which are a combination of core skills and soft skills that are to be used on a daily basis (Gauthier, 2020d). Credentials are an integral part of CTE education, but misconceptions what constitutes a valid CTE or industry credential can minimize their value for the student or graduate (Hendricks, Myran, Owings, et al., 2021). Despite issues with perceptions of credentials, they are necessary so the student can demonstrate that they have an applicable knowledge base to a potential employer.

CTE credentialing evaluates the student's mastery of two types of content that are related to employability. Work-readiness assessments are used to determine the student's proficiency in personal and soft skills. These types of skills include intrapersonal communication, the ability to collaborate with others, and self-management. The second evaluation is technical or subject specific assessments that are used to determine the student's proficiency in academic subjects and technical knowledge within their CTE discipline. This type of assessment falls within two categories: state CTE program assessments, leading to a degree, and industry recognized certifications (Dalton et al., 2021; Hendricks, Myran, Owings, et al., 2021).

Certifications

Certifications are credentials that are awarded and governed by business and industry associations but are not awarded by a community college or other education entity as part of a course of study. Certificates are also different from licenses, which legally authorize an individual to perform a specific type of work (Dalton et al., 2021; Hendricks, Myran, Owings, et al., 2021). Certificates, however, may be included as part of a course of study in a degree program and awarded when a module within a core class is completed. An example of this type of application of a certificate is the NC3 certification for precision measurement. The student has an opportunity to earn an NC3 measurement certification when they complete the required,

imbedded curriculum, and then take a certification test proctored by an NC3 authorized provider or instructor. These types of certifications are also referred to as micro-credentials and are awarded to students who have completed a component of a more extensive CTE curriculum. Micro-credentials help employers identify authentic skills, demonstrating competency and experience, which many employers perceive to be more valuable than academic degrees (Gauthier, 2020d; Prebil & McCarthy, 2018).

CTE Degrees

CTE programs, at community colleges, usually offer an associate degree of applied science to students who complete two years of academic and technical labs and classwork. The degree is designed to demonstrate to an employer that the potential employee has the education, skill set, training, and technical knowledge needed to perform proficiently in the workplace (Hendricks, Myran, Owings, et al., 2021). A degree differs from certifications by incorporating academic courses as part of the degree plan and emphasizing both academic and technical competencies (Hendricks, Myran, Katsioloudis, et al., 2021). CTE degree programs correlate with the shift from vocational education to CTE by providing an academically rigorous and robust approach to technical learning (Hodge et al., 2020).

Credentials Issues

Despite CTE's emphasis on academics and industry certifications, many employers and students still believe that CTE programs do not have the same academic rigor as degrees earned at four-year institutions (Hendricks, Myran, Katsioloudis, et al., 2021). Further, there are more than 5,000 different certifications available in the U.S. The offerings vary from state-to-state and by industry providers, creating confusion by having different requirements, including inconsistent definitions and applications (Prebil & McCarthy, 2018). Employers have noted these discrepancies by reporting that credentials are inconsistent in their value, and have different

levels of quality, even when presented by the same organization. As industry rapidly changes to adjust to new technology and processes, industry expects CTE programs to make the changes needed to align curriculums with required industry proficiencies (Gauthier, 2020d). Exploring employer experiences with credentialed, new employees will help to determine if CTE programs have alignment gaps between credential curriculums and the needs of employers.

Teacher Preparation

The faculty of CTE programs are essential to the success of the students. Unlike typical college level instructors, CTE instructors are not required to have a master's degree to teach in their field. Usually, an associate degree and a minimum of practical experience within a technical discipline is all that is required to teach CTE classes. While many college administrators believe teaching with an associate degree is academically substandard, the lack of quality candidates requires schools to hire instructors with minimum or lesser qualifications. Further, in many cases it is not practical to require instructors pursue advanced degrees because many technical disciplines do not have higher degree offerings or opportunities (Gauthier, 2019). For most CTE programs, experience in the field is more important than the instructor's level of post-secondary education or degree obtained (Wagner et al., 2021).

Industry Experience

Graduates of CTE programs are expected by employers to have a general understanding of the skills needed to be employable. One of the ways to help students learn these skills is to hire instructors with prior industry experience or with non-academic professional backgrounds (Hora & Lee, 2021). It is important, however, that instructors with industry experience are able to communicate their knowledge in the classroom. Instructors, with industry background, often come to education after retiring or being displaced from the primary career preference. When they enter academia, they are expected to adapt to new routines and workloads, usually with little

or no support. Studies have demonstrated that CTE students benefit from having instructors that have a background in a specific, technical discipline (Wagner et al., 2021). Providing support for these instructors with professional development and mentoring will improve the quality of instruction that they will be able to provide.

Skills

Defining the concept of skills can be difficult because academics, employers, and workers view employability skills different and within the context of what skills a specific job or task requires to be completed. In general, when employers refer to skills, they usually mean the ability to perform a specific task or job and includes the knowledge and work habits needed to support those skills (Alic, 2018; McGunagle & Zizka, 2020). Skills underpin employability, where individuals obtain the ability to gain initial employment by using the skills they have learned on the job and/or in the classroom. The ability to obtain and utilize skills also increases the ability of an individual to maintain employment (Hillage & Pollard, 1998; McGunagle & Zizka, 2020; Rebele & St. Pierre, 2019). Employers continue to state that it is difficult to find graduates that are competent in relevant skills. In contrast, most educators believe that they are providing students with the skills they need to be ready to enter the job market at graduation (Alic, 2018; Baird & Parayitam, 2019; Gauthier, 2020b; Karimi & Pina, 2021). When asked to define what specific skills employers wanted from new employees, the answers were greatly varied. In general, however, there are two primary skill categories that employers' rate as important or highly important, soft skills and 21st century skills (Alic, 2018; McGunagle & Zizka, 2020; Rebele & St. Pierre, 2019).

Soft Skills

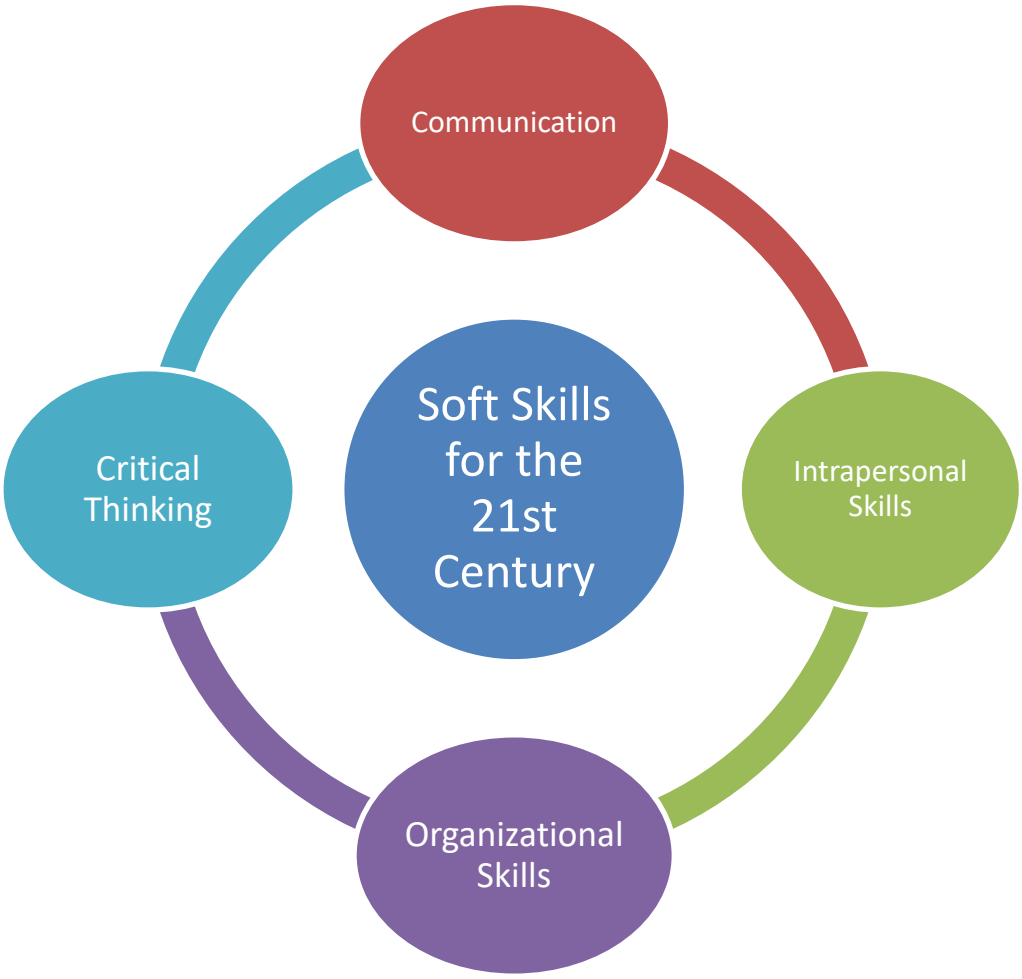
Soft skills in CTE are defined as non-technical skills that include communication skills, especially intrapersonal skills, such as the ability to communicate with co-workers, writing skills,

organizational skills, critical thinking skills, and ethics (Bradberry & De Maio, 2018; Rebele & St. Pierre, 2019). Primary soft skills are depicted in image 2. While soft skills are expected to be included in a standard education program, there has been a lack of emphasis of soft skills in CTE, and there is a need to properly integrate soft skills into the CTE curriculum (Burch et al., 2019). The importance of soft skills to employers is evident in the current research on the subject, and often these skills are rated higher than technical skills, such as the ability to use a specific computer software program (Bradberry & De Maio, 2018).

While soft skills are rated important by employers, there are several issues that may interfere with effective implementation of soft skill courses and supplemental curriculum. Soft skill courses tend to be one-credit certifications that are intended to demonstrate to employers that the graduate has been taught basic workplace skills. CTE programs have a finite number of credit hours that are shared between academic and technical courses. Soft skill courses may be offered as an elective, which may be ignored by the student that has already had similar coursework in high school or prefers to take additional academic or technical courses (Hendricks, Myran, Katsioloudis, et al., 2021). Another issue with soft skill courses is the perception by students and faculty that they are not as valuable as CTE program core classes. The term *soft skills* communicates that the course content may not be as academically rigorous or professionally important as a core class that students perceive as having a direct impact on their potential employability (Berdanier, 2021). Changing perceptions of soft skills and emphasizing its content as an important component of CTE curriculum may help to improve the CTE graduate's success in the workforce (Berdanier, 2021; Hendricks, Myran, Katsioloudis, et al., 2021; Rebele & St. Pierre, 2019).

Figure 2

Soft Skills



Note: Primary soft skill categories (Bradberry & De Maio, 2018; Rebele & St. Pierre, 2019).

21st Century Skills

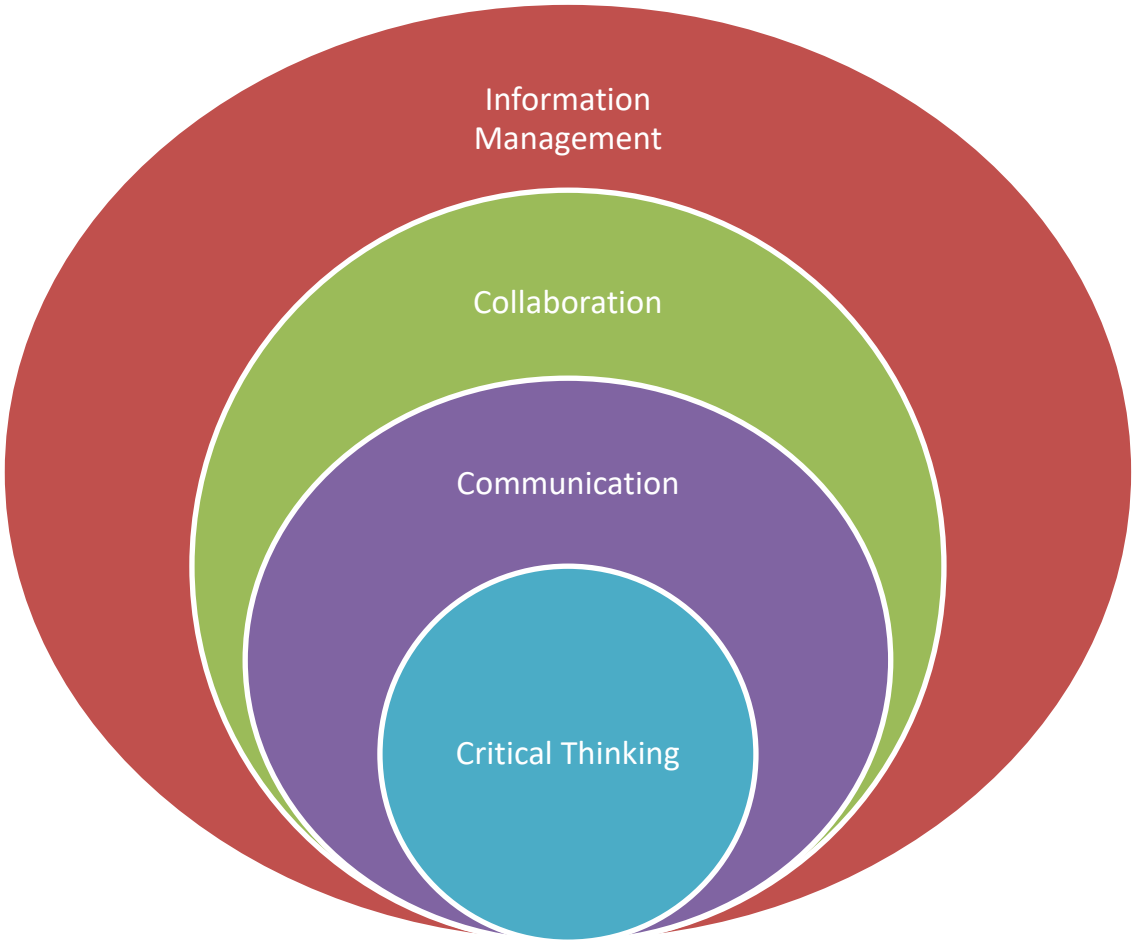
Employees obtain value by accumulating knowledge and then having the ability to apply that knowledge in the workplace. Today's employers are seeking what is now being referred to as 21st century skills, which refers to higher-order cognitive skills, social skills, and digital skills. Teaching 21st century skills is necessary to keep industry competitive in a rapidly changing, technical economy. The primary skills associated with 21st century skills are depicted in image 3. These skills are broad in scope, building on the concept of soft skills, and includes technical

knowledge and information literacy in its approach (Koehorst et al., 2021; McGunagle & Zizka, 2020). These skills are designed to bridge the gap between what is learned in educational programs and the practical, technical skills that are needed in the workplace (McGunagle & Zizka, 2020). Many employees possess general skills, which are defined as skills that can be taken from job to job but lack firm-specific skills, which are those skills that apply to a specific employer (Alic, 2018).

There are seven primary 21st century skill types, including operational skills, information management skills, communication skills, the ability to collaborate with others, creativity, critical thinking, and problem solving. Expanded skills sets include ethics, citizenship, and community involvement. While some of these skills overlap those associated with soft skills, twenty-first century skills focus on application of skills beyond the importance of showing up for work on time (Koehorst et al., 2021). CTE programs are beginning to incorporate the twenty-first century skills model into their curriculum to ensure that the knowledge and skills being taught in the classroom are in alignment with the current workforce needs. If CTE programs do not provide employers with the correct mix of skills needed for the success of the business, then CTE programs will not be able to meet the needs of current and future labor market demands (Sublett & Tovar, 2021)

Figure 3

21st century skills.



Note: Primary 21st century skills (Koehorst et al., 2021; McGunagle & Zizka, 2020; Sublett & Tovar, 2021).

Curriculum Alignment

Successful CTE programs will implement techniques to assure alignment between program curriculum and industry needs. To assure this alignment occurs, CTE programs must be responsive to input received from industry leaders and use teaching techniques that expose students to real-world situations (Boettcher, 2019). To create leaning activities that mimic

situations in the workplace, simulations may be deployed that create realistic learning situations that help to develop complex skills. Simulations align with experiential learning techniques by creating a learning environment that deepens understanding of concepts and the relationships between them with hands-on activities (Chernikova et al., 2020). To assure simulation activities are relevant and applicable to workplace needs, Industry Advisory Partnerships have been created to help intensify any skills gaps between graduates and employers. Industry leaders meet with local CTE instructors and administrators to collaborate on the type of instruction and materials needed to prepare employees for the workplace (Boettcher, 2019; Wrye et al., 2019). Another way to assure students are learning applicable workplace skills is through apprenticeships. These programs, that are in used in conjunction with a community college CTE program, allow students the opportunity to work with a mentor, on the job, and provide an opportunity to use classroom taught skills in a real-world working environment (Anderson & Keily, 2021).

Simulations

Technical industries lack sufficient semi-skilled and skilled workers to fill current positions, lacking the time and resources needed to provide technical training for new employees (Mohammadi et al., 2020). Graduates of CTE programs not only need to have theoretical comprehension of the technical requirements of their field, but they must also have practical understanding that can be applied immediately after being employed. An effective way for students to learn how to apply what they have studied via classroom instruction is through the use of simulations. Simulations mimic real word situations in a controlled environment. By using simulations, students are able to develop a deeper understand of taught concepts and the relationships between them. They also learn problem solving, critical thinking skills, and how to navigate real world situations (Chernikova et al., 2020). Simulations help to prepare the student

for employment by exposing them to real world scenarios that match the type of situations that they are likely to find in the workplace.

Industry Advisory Partnerships

Employer surveys and interviews have determined that there is a skills gap between graduates and employers that should be addresses by CTE administrators and instructors (Wrye et al., 2019). An effective way to communicate with employers and provide input from local industry into CTE curriculum is an Industry Advisory Board (Gauthier, 2020c). The advantage of these boards, which are a collaboration of industry and education stakeholders, is that CTE program leaders will be able to determine the needs of local employers and adapt their teaching methods accordingly. As technology changes, the needs of industry changes, and disciplines that may have been emphasized in the past are no longer relevant in today's industrial, technical environment. The committees may also coordinate apprenticeship or job shadowing opportunities so students can see what their responsibilities and duties would be on the job (Gauthier, 2020c). Industry Advisory Boards are an important part of CTE programs and curriculums because instructors are able to determine if the material they are teaching is relevant to current industry needs.

Apprenticeships

Education in the United States has primarily been school-based, with learning content using traditional pedagogy. Industry has consistently noted that basic, entry level skills are not evident in graduates of technical or workforce programs (Jacobs & Worth, 2019). To address issues of alignment between employer needs, workforce, and CTE curriculum, there has been a renewed focus on the use of apprenticeships. Apprenticeships use work-based learning that combines on-the-job training, classroom instruction, and an industry associated mentor to prepare students for a career in a technical field (Anderson & Keily, 2021). Community colleges,

which provide the majority of CTE education and credential pathways, facilitate apprenticeship programs by providing the classroom and instruction component of the process. Community colleges often have relationships with local industry and are able to create programs that are based on input from these stakeholders. These alignments of CTE curriculum and career pathways are referred to as *programs of study* (Anderson & Keily, 2021; Mindham & Schultz, 2019).

Apprenticeships have been used for centuries and are considered one of the earliest job training programs. Youth, typically males, would learn skills from a master craftsman, such as a stone mason, usually living with their mentor until they learned the specific skill or trade. Learning was accomplished by observation, instruction, and hands-on activities (O'Banion, 2018). Modern apprenticeships are more complex and regulated, with students participating in registered apprenticeships regulated by the U. S Department of Labor and/or a state apprenticeship agency. Registered apprenticeships are defined as a career pathway that is high-quality, industry-driven, provides employers a process to develop a future workforce, and allows individuals to obtain paid work experience, wage increase, classroom instruction, and a nationally recognized credential (Jacobs & Worth, 2019; Kardel, 2021; United States Government, n.d.).

Registered apprenticeship programs are unique from other learning programs in several different ways. First, these programs are industry led, with the college, employer, and apprentice agreeing on the type of instruction that will be presented, the amount of pay, and the opportunity to learn on the job. Second, these programs are usually registered with the U.S. Department of Labor and are required to follow specific guidelines that regulate the number of hours worked, the type of employer that can offer apprenticeship opportunities, and approves the training

provider that will be responsible for related technical instruction in the classroom. Third, students receive instruction from an experienced mentor that is already working in a technical field. The mentor provides structured, hands-on learning opportunities that prepares the apprentice for entry into the workplace. Fourth, registered apprenticeship programs receive worker protections, while learning in a controlled environment. Apprentices receive additional safety training and supervision to assure that they are safe when learning on the job. Finally, apprentices earn portable, national and industry recognized credentials that they can use to demonstrate that they have the skills needed to enter the workforce (Anderson & Keily, 2021; United States Government, n.d.).

A quality work-based learning program provides competence through challenging work, the opportunity to gain understanding, and clear expectations and feedback. Work-based learning has been shown to build technical skills, as well as the soft skills that are expected by employers (Mindham & Schultz, 2019). Successful, registered apprenticeship programs will focus on three key areas to assure that the program provides the appropriate learning opportunities. First, the apprenticeship program must assure that the curriculum is aligned with the needs of all stakeholders. These stakeholders include the student, employers, supervisors, union representatives, teachers, upper management, college administration, and community leaders. It is important to identify all stakeholders to assure that the program is providing a clear and effective pathway to employment. Second, the apprenticeship program should be limited only to workplace learning. Today's employers also seek employees that have foundational knowledge, critical thinking skills, communication skills, and interpersonal relationship skills. Many CTE curriculums focus solely on technical skills and do not emphasize the need for a robust and broad skill set. Finally, an effective apprenticeship program provides the tools and materials needed to

learn successfully. Students need access to current tools and technology systems that are being used in the workplace. Out of date or obsolete technology, especially in the classroom, does not prepare the student to enter a workplace where advanced technology and equipment is being used (Anderson & Keily, 2021; Gallup, 2020).

Despite the many benefits of a registered apprenticeship program, many employers and community colleges are unaware of how to effectively create an effective apprenticeship program (Kardel, 2021). The need for prepared technical workers has led to a renewed focus on CTE programs and apprenticeship opportunities. The Trump and Obama administrations both proposed expansions of the registered apprenticeship program. The proposals sought to expand apprenticeship programs beyond the traditional collective bargaining model, unhitching it from a union/management paradigm. Second, the proposals sought to expand the apprenticeship program to include new career paths, such as insurance, hospitality, nursing, and information technology (Jacobs & Worth, 2019). This desire to enhance and expand apprenticeship opportunities has led the Biden administration to dedicate part of the $48 billion proposed for workforce training to be used to fund an additional one to two million new registered apprenticeship opportunities in the United States (Kardel, 2021). However, the success of registered apprenticeship programs is directly tied to proper alignment between the needs of the employers and the technical curriculum. Only by identifying key stakeholders, skills, and competencies, including program curriculums, will these programs produce outcomes that benefit both employers and students (Anderson & Keily, 2021).

Employer Perspectives

The purpose of education institutions is to prepare graduates to enter the workforce with the skills they need to be workforce ready when they are hired (McGunagle & Zizka, 2020).

However, the range of skills that employers want or need varies greatly by employer, industry, and region, and a lack of uniform standards by employers can cause difficulty for community college CTE curriculum design (Alic, 2018; Baird & Parayitam, 2019). There is an assumption by CTE instructors that employers are seeking to hire graduates that have mastered only the technical side of their craft. While a technical education is very important, employers most often note that the graduates they hire are lacking non-technical skills. These *soft skills* include behavioral skills, interpersonal skills, communication, and critical thinking skills (Gauthier, 2020b; Hollister et al., 2017). For employers, the value of a community college CTE degree was dependent on the aptitude of the graduate. The listing of a degree on the employment application was not a guarantee that the graduate would be competent in their field. While graduates are expected to have the ability to perform basic tasks on day one, employers do not assume this will be the case until the new graduate begins work and is evaluated. Employers did note, however, that a CTE degree was more likely to move a candidate further in the hiring process than those candidates that did not have a technical education (Gauthier, 2020b).

Employers determined that a real-world working environment is very different than an educational environment. The emphasis on technical skills by instructors may explain why employers note that many new graduates are technically skilled but are unable to interact with clients or with co-workers. Graduates also have trouble adapting to a changing environment, after spending two-years in a controlled classroom (Gauthier, 2020b). Employers have a need for employees that are adaptable and can work independently. Hollister et al. (2017) noted that employers are seeking well-rounded individuals who have both technical and personal skills. In their study, Hollister et al. (2017) reported that the term *people skills* was used more than *technical skills* when employers were asked what type of skills they desired in new employees.

CTE program creators need to be aware that employers are looking for graduates that have a broad range of skills and are flexible on the job. Successful CTE programs will emphasize interpersonal and technical skills in their curriculum (Gauthier, 2020b). When evaluating the literature associated with employer perceptions of CTE programs, there is a lack of literature that explores the experiences these employers have with CTE program graduates, especially graduates of a specific CTE program. Most studies are broad in scope and discuss preparedness in general terms.

Summary

Experiential learning has been part of career and technical pedagogy for many years (Clark et al., 2010). Experiential learning is an active process that is developed through direct engagement and supported by experience, analysis, and reflections. It is a learning approach that helps learners develop the skills and knowledge they need to prepare for future, technical careers (Habib et al., 2021). Constructivism also leads to active engagement, motivation, problem solving skills, and unique learning experiences (Vygotsky, 1978). Both experiential learning and constructivism enhance the delivery of career technical education by using hands-on learning techniques and real-world experiences to equip students with the skills they need to be successful in the workplace.

Historically, vocational education has been a pathway for those who were likely not able to complete a four-year degree, needing training for a viable career (Michaels & Barone, 2020). However, as the demand for technically skilled workers increased, there was a need for improvements to the quality of this type of education and expanded program offerings. Legislation, such as the Perkins Act, led to improvements in CTE programs and alignment with more rigorous academic programs these changes provided “higher quality job prospects, higher

financial gains and a reduction of poverty" (Michaels & Barone, 2020, p. 4). Gaps in the literature include a lack of studies that evaluate employer experiences with CTE graduates and an evaluation of experiential learning as an appropriate framework for CTE education (Clark et al., 2010).

For CTE programs to be successful it is important to hire instructors that have in-depth industry experience (Gauthier, 2019). Instructors that are familiar with the real-world requirements of a technical discipline provide a deeper understanding of the skills needed to for students to be successful in the workplace. Employers, however, are seeking more than technical skills from their graduates, and new employees also need interpersonal skills to be effective in the workplace (Hollister et al., 2017). Industry Boards are an effective way to align community needs with the curriculum of CTE programs. Collaboration between all stakeholders will benefit both employers and graduates, which will improve student and college outcomes (Gauthier, 2020c).

CHAPTER THREE: METHODS

Overview

The purpose of this phenomenological study is to examine what skills alignment gaps exist between graduates of Industrial Systems Technology CTE programs and local industrial employers Chapter Three of this study presents the methods used for data collection, data analysis, and the structure of the study. This chapter includes the study design, research questions, setting, participants, the researcher's role and relationship to the study, data collection, analysis procedures, frameworks, and assumptions. The chapter concludes with trustworthiness and a summary.

Research Design

This study uses a qualitative research approach, which will be used to explore the shared experiences of employers who hire Industrial Systems Technology graduates. Qualitative research is appropriate for this study because it is used to study a problem or issues that affects a specific group or population (Creswell & Poth, 2018). Qualitative studies are designed to focus on the type and meaning of an experience that is described by those individuals who are experiencing the phenomenon (Tomaszewski et al., 2020). Since each employer's experience will be unique, a qualitative study will give voice to those experiences, and reveal shared trends and patterns within those experiences (Creswell & Creswell, 2018). Employers of Career Technical Education (CTE) graduates have expectations that new employees that have completed these programs will be able to begin work with a basic set of skills that will allow them to contribute to the needs of the workplace (Gauthier, 2020b). Employer expectations of the skill level of college graduates is usually measured using surveys within a quantitative framework. These studies commonly conduct surveys, using a 5-point Likert scale, reporting

broad trends, generalizing it across a group of participants. Qualitative studies, however, provide details that can only be established by talking directly with those stakeholders that have been directly affected by the phenomenon (Creswell & Poth, 2018). A qualitative approach will allow the voices of those who experience the same phenomenon to be heard, with meaning assigned to these experiences.

A phenomenological approach will be used to structure this study. Phenomenological research is used to explore the shared meaning of a group of individuals that have the same experience, discovering differences and similarities between those experiences (Creswell & Poth, 2018). Each employer interviewed in this study will have experienced hiring a graduate from a CTE program, integrating them into their workforce. Creswell and Creswell note that phenomenological studies are used to describe the essence of the studied experience. By using open-ended, focused questions, an exploration of employer experiences will reveal information that will provide insight into the quality of a specific CTE program and the employers that reside within the same geographical area.

This study will also use a transcendental phenomenological approach to this issue. Phenomenological studies attach common meaning to the experiences of several individuals (Creswell & Poth, 2018). Further, the study will also be transcendental in nature because the goal is to minimize researcher interpretation, focusing on the experiences of the participants. A qualitative approach will provide a greater depth of detail because it will describe the meaning of a shared experience of a phenomenon (employing graduates of a specific college program) by the people who are living it (Tomaszewski et al., 2020). Since a specific context with a specific group of individuals is being studied, purposive sampling will be used to find participants for this study. Purposive sampling is used when intentional selection of research participants will

provide a pool of individuals who are best suited to answer the research question. (Johnson et al., 2019). The qualitative method is the best approach for this study because it describes the experiences of a specific group who are sharing the same phenomenon, allows for the development of themes from participant discussion and observation, and will allow for a description of the experience in written form (Creswell & Poth, 2018).

Research Questions

The following questions will guide this study.

Central Research Question

How do employers of graduates of Industrial Systems Technology programs describe their experiences with these new employees?

Sub-Question One

How do employers of Industrial Systems Technology graduates determine new employee skills gaps?

Sub-Question Two

How do employers fill in new employee skills gaps?

Sub-Question Three

What is the employer's perception of the effectiveness of CTE college programs?

Setting and Participants

The choice of participants and locations is designed to focus on employers who are within immediate proximity to a community college that offers CTE programs and have hired graduates of those programs. The study is designed to discover what experiences employers have with graduates of Industrial Systems Technology Programs. Each school in the study, however, does not use the exact same terminology for their Applied Associate Science (A.A.S.) technical

degrees. While there may be differences in names, the curriculums will be very similar in their offerings and approach to instruction. Prior to beginning site and participant selection, a request will be made to Liberty University's Institutional Review Board (IRB) to assure the survey questions are properly designed (see Appendix A). Sites and participants will be selected from industry located in Northeast Alabama.

Setting

The setting of this phenomenological study is the production and manufacturing industry located in Northeast Alabama. Northeast Alabama is comprised of four counties, with each county being home to a community college. The counties associated with this study that are Alpha County (home to Community College One), Baker County (home to Community College Two), Charlie County (home to Community College Three), and Delta County (home to Community College Four). Pseudonyms being used in the study, to assure participant confidentiality. Interviews will be conducted on site at those businesses that agree to participate in the study, and the goal of the study is 12-15 participants. Participants will be given pseudonyms to prevent their association with their specific workplace. The number of participants in this study is designed to achieve data saturation. Data saturation, in qualitative studies, is the point where a sufficient amount of information has been acquired to develop meaningful themes and narratives (Mthuli et al., 2021). Each county in the study has an extensive industrial presence and employs technically trained CTE individuals.

Alpha County

Alpha County has a population of over 90,000 and employs over 38,000 people in different sectors. The largest employers are in product distribution and medical care. Alpha County is located in close proximity to primary transportation routes and attracts a variety of industry, including distribution and manufacturing. Companies that employ technically skilled

workers includes companies that engage in distribution, automotive production, electronics, food processing, and distribution centers (Alpha County Economic Development Agency, n.d.).

Baker County

Baker County has an area population of slightly under a 100,000 and is composed of primarily small communities. The primary employer is the manufacturing industry. Baker County is located in close proximity to primary transportation routes and attracts a variety of industry. Companies that employ technically skilled individuals include areas such as metal fabrication, automotive production, food processing, plastics, and data centers (Baker County Economic Development Authority, n.d.).

Charlie County

Charlie County has an area population of over 500,000, which live within one hour's commute of local industry. There are over 60,000 individuals who work in manufacturing jobs. Etowah County has extensive industry which employs technically skilled individuals. All of these industries have revenues over 50 million dollars. Targeted sectors by the Charlie County Economic Development Board include automotive, aerospace, food processing, metalworking, and plastics and chemicals (Charlie Economic Development, n.d.).

Delta County

Delta County has an area population of over 899,000 within a 45-mile radius of the county seat. There are approximately 19,000 employees working within the county. Delta county has a significant industrial presence, with the poultry industry being the largest employer. Target sectors by the Delta County Economic Development Board include poultry, food processing, and automotive manufacturers (North Alabama Industrial Development Association [NAIDA], n.d.).

Organizational Structure

The businesses that will be the site of this study will be focused on production or manufacturing, employing technicians that hold an Industrial Systems Technology degree or equivalent credentials. Equivalent credentials will be defined as a A.A.S. degree obtained at a community college that has a similar curriculum. Industrial employers typically have a similar administrative hierarchy consisting of a plant manager, assistant plant manager, department heads, e.g. maintenance supervisor, and support personnel. While each administrative level will likely interact with graduates of CTE programs, individuals participating in the study will have direct experience with CTE graduates that they employ. Unless the participant requests an offsite location, interviews will take place at the participants' place of employment.

Participants

Participants in the study will consist of any stakeholder who has a direct role in the hiring and deploying of Industrial Systems Technology graduates. For the study to have merit, it is necessary for all participants to have experience with this phenomenon (Creswell & Poth, 2018). Stakeholders for the study may include maintenance department supervisors/managers, human resource managers, and plant managers. Initial contact will be with each location's gatekeeper. A gatekeeper is defined as the person or persons a researcher must first contact to obtain access to a study site (Creswell & Poth, 2018). After receiving permission from each location's gatekeeper, participants will be solicited by email, letter, or phone call. Contact information will be obtained from company websites and through each industrial location's human resource department.

To be eligible to participant in the study, participants must have been directly involved in the hiring process and have direct knowledge of the CTE employees work performance. Since these employees are required to demonstrate technical skills, stakeholders that have technical knowledge are a priority for this study. Qualifications will be verified via a questionnaire that

will authenticate the participants role at the company and their qualifications, such as number of years of experience in the field of industrial maintenance. The goal for the study is approximately 12 to 15 participants, drawn from industry that employ CTE students. This sample size is sufficient to reach saturation, which is understood to be the point where there has been satisfactory data collection. When the researcher is no longer finding new information that adds to the understanding of the phenomenon, the study has reached saturation, and no additional participants are needed (Creswell & Poth, 2018; Mthuli et al., 2021).

To participate in the study, each interviewee will be required to complete an informed consent before being interviewed (see Appendix B). Proper selection of participants will assure that data will be collected from individuals that have experienced the same phenomenon (Creswell & Poth, 2018; Mthuli et al., 2021). Because participation in the study is directly drawn from position or role, i.e. maintenance manager, specific demographics will not be noted or used to determine participant viability. It is expected that participant bias, that may be based on demographic related experiences, such as the pre-conceptions of CTE by a participant of 1980s vocation education, will be revealed through interpretation of the participants' interview question response. Pseudonyms will be used to protect the identity of each participant and institution.

Researcher Positionality

I am a CTE instructor at a community college in Northeast Alabama and am extremely passionate about CTE programs and the impact they can have on individuals and their families. Graduates of CTE programs have access to high-skilled, high-wage jobs that do not require a bachelor's degree (Sublett & Tovar, 2021). I teach all of the curriculum associated with Industrial Systems Technology, and my concern as an instructor is that the topics and skills being

taught may not align with the needs or expectations of local employers. As a program instructor, however, I am aware that I may be biased towards the curriculum that we use and view our program outcomes as sufficient for potential employers. My position and role as a CTE instructor will lead me to engage in reflexivity, which posits that the researcher's preconceptions and biases can influence study direction and outcomes (Creswell & Poth, 2018; Johnson et al., 2019). There is a potential for bias since the results of this study may demonstrate that the material that I teach does not benefit the student. It will be important not to view study results negatively because of this bias. It is important to understand personal bias and its potential influence on the interpretation of the study's results (Creswell & Creswell, 2018).

Interpretive Framework

The interpretive framework for this study is social constructivism. The participants in this study will be sharing their experiences with graduates of a CTE program. Social constructivism posits that individuals seek understanding of the world within which they live their daily lives (Creswell & Poth, 2018). The participants in this study interact daily with employees who are required to work in a skilled technical environment. Further, they also are familiar with the educational background of these employees. The employers for this study are drawn from multiple locations because, even though many of these programs have the same or similar learning outcomes, each employer will have a different set of experiences and perceptions with Industrial Systems Technology graduates (Clark, 2018).

Philosophical Assumptions

The researcher should identify their philosophical worldview because it helps to explain why they chose their study method and how their worldview will influence the collection and interpretation of information (Creswell & Creswell, 2018). Since the interpretive framework for

this study is social constructivism, it follows that the constructivist worldview would guide the philosophical approach to this study. The lived experiences of the study participants will present a variety of perspectives that will allow the development of theses. These themes will provide insight into the relationship between the colleges that provide CTE programs and the employers that hire these program graduates. Evidence will be gathered by recording the subjective experiences of the participants/employers (Creswell & Poth, 2018).

My pursuit and processing of information is formed by the Christian worldview that there is absolute truth that is known and that is waiting to be discovered. Psalm 119:30 says, "I have chosen the way of truth; I have set Your ordinances before me" (*Holman Christian Standard Bible,* 2003). Researchers should decide prior to beginning research that they will choose truth and report outcomes with no agenda or bias. A qualitative study aligns well with this worldview because the researcher is expected to reveal their own values and biases, as well as the values that are part of the information that is gathered (Creswell & Poth, 2018). The belief in absolute truth does not discount the lived experiences of the individual. All participants bring knowledge to new experiences and interpret that knowledge on past interactions, learning, and personal biases (Garmston & Wellman, 1994).

Ontological Assumption

Ontology is an assumption about the nature of reality and is a process by which something is determined to be real (Creswell & Poth, 2018). An ontological position posits that reality varies depending on the viewpoint of the individual. The researcher reports these views and then seeks to explore the themes that develop during the research process. Social constructivists believe learners construct new information by relating it to past experiences (Creswell & Poth, 2018; Clark, 2018). The focus for the teacher is not motivation but learning and knowledge. When an instructor facilitates knowledge, the learner will then construct beliefs

about their capabilities that will then lead to their constructing motivational beliefs. My teaching uses a learner-centric model, constructivism, do help students construct meaning from laboratory experiences using guidance and feedback. Experiential style learning helps the learner to develop a better understanding of the world in which they work, and helps to prepare them for a technical, critical thinking career path (Creswell & Poth, 2018; Clark, 2018; Schunk, 2020).

Epistemological Assumption

Epistemology is a method used to interpret knowledge and is used to determine how knowledge claims are justified by the researcher (Creswell & Poth, 2018). Rationalism and empiricism are the two epistemological positions used to discuss the origin of knowledge and its relationship with the environment (Schunk, 2020). This study takes an empirical view of knowledge and posits that the experiences study participants have with CTE graduates comes from external interactions with their environment and are not derived from reason alone. The outcomes of the study will be drawn from both deductive and inductive evidence. This pragmatic approach uses diverse methods to collect and analyze the evidence gathered through interactions with study participants (Creswell & Poth, 2018). This study takes a subjective view of experience, understanding that, while each participant will have their own interpretation of experiences with CTE graduates, truth is not subjective or open to interpretation.

Axiological Assumption

The axiological assumption of a qualitative study is the admission that the study is value-laden and that the researcher will be transparent in regard to their personal values and biases. These positionality biases may derive from the researchers age, gender, race, personal experiences, political, and professional beliefs (Creswell & Poth, 2018). A researcher's beliefs, experiences, and backgrounds may influence any part of the research process, such as question

selection or how the results are interpreted or presented (Johnson et al., 2019). An assumption of this study is that the findings will reduce gaps between the curriculum of CTE programs and the needs of industry employers. Researcher values and assumptions will be discussed so that knowledge will reflect the views of both the researcher and the participants (Creswell & Poth, 2018). Researcher background and experience is not viewed as a negative because both are needed to effectively understand the experiences of the participants but should not damage objectivity when presented the results.

Researcher's Role

In this qualitative study, my role as researcher is to facilitate the collection of data, select relevant sites, explain why the research is necessary, interpret the collected data, and report the findings (Creswell & Creswell, 2018). My interest in this topic comes from my own experience as a CTE instructor and my discussion with area employers who hire our graduates. These employers have made anecdotal comments on the alignment of CTE program teaching and their immediate needs. Current research focuses primarily on the employability of CTE graduates, the focus is primarily on longevity, earnings, and program completion. Poorly prepared CTE students are not always dismissed from their jobs, and employers will often provide remedial training to improve employee performance (Gauthier, 2019). My intent is to use this study to discover what CTE employers experience with program graduates. As a CTE instructor I have program bias, believing that our program is current and relevant. Conversely, interactions with employers lead me to expect that there is already an issue with skill alignment. As a researcher, I will have to be aware of both potential biases and view all new data objectively (Creswell & Poth, 2018). The participants in this study are separate from the community college system and the CTE programs. I am not in an authoritative position over any of the participants of this study.

Procedures

Procedures for this study are dependent on approval from the Liberty University Institutional Review Board (IRB). Since human subjects are to be used in this research, ethical considerations will be considered before initiating the study. The study will focus on industry that is located within Northeast Alabama. Since the data collected may reflect negatively on the institutions that provide CTE graduates, anonymity of participant location and CTE providers will be paramount. Data will be collected through interviews with stakeholders (supervisors and managers) that interact daily with employees that are CTE graduates. Information will be gathered through semi-structured, open-ended questions. After data is gathered, themes will be identified and interpreted. A summary of the procedures for this study are summarized in Table 2.

Table 2

Summary of Research Procedures

1. Obtain committee approval for research proposal.
2. Submit IRB proposal and receive approval for research using human subjects.
3. Solicit research sites located in Northeast Alabama, receiving permission from gatekeepers to contact relevant participants. Build list of prospective participants.
4. Request access to artifacts, such as job descriptions, hiring procedures, and internal training policies.
5. Contact prospective participants via phone and email to solicit participation in the study and to obtain informed consent.
6. Schedule face-to-face interviews. Prior to interview, obtain informed consent.
7. Process interview data and begin analysis.

8. Schedule focus group interviews.
9. Process interview data and continue analysis.
10. Follow up with participants to ensure credibility, using member checking.

Permissions

Before the study is conducted, permissions will be obtained prior to collecting any study data. First, an IRB application will be submitted using the Liberty University IRB portal. Second, after IRB approval, industry managers, presidents, and relevant stakeholders will be contacted to obtain permission to contact supervisors and human resource managers. Third, participants in the study will give their permission to be recorded by signing the study consent form. Since the questions associated with this study have a direct impact on the perceptions others may have of each school's CTE program(s), it is important that confidentiality is strictly maintained. An examination of the study will not reveal which employer or college is being discussed.

Recruitment Plan

To effectively conduct a qualitative research study, a sufficient sample is needed to obtain a satisfactory collection of data. Qualitative research is usually associated with a small sample size, but there is no exact solution for determining the appropriate number of participants (Mthuli et al., 2021). In general, it is recommended that a phenomenological study have three-10 participants (Creswell & Creswell, 2018). Liberty University states that this sample size should have a minimum of 10 participants and no more than 15, unless prior approval is obtained (*Qualitative Dissertation Template*, n.d.). The study will have between 12-15 participants. After all permissions are obtained from industries located in Northeast Alabama, maintenance managers and HR managers will be contacted via email and phone call. This initial contact will explain the purpose of the study, the benefits of the study for both the colleges and industry, and

a description of the process (interview procedure, time needed, and location. For stakeholders that agree to participate in this study, consent will be obtained. The sampling strategy to be used for this study is typical case. Typical case sampling seeks to highlight what is typical or average (Creswell & Poth, 2018). This approach is designed to determine what typical skills and knowledge is needed by employers from CTE graduates.

Data Collection Plan

Common meaning and experience from a group of individuals that have experienced a common phenomenon is explored using a phenomenological, qualitative study (Creswell & Poth, 2018). To explore these experiences, individual interviews with each participant will be conducted. These interviews will be scheduled with each individual. Focus groups will also be used to provide study triangulation and validate themes drawn from the individual interviews. To determine issues with employability, skill and curriculum alignment, complete candor is needed from those who agree to participate in this study.

Interviews

The first data collection method will be individual interviews. After participants have agreed to be in the study and completed the consent form, a time will be scheduled for an interview to be conducted, with approval of appropriate supervisors, at the participants workplace. Prior to asking specific interview questions, the participant will be asked to give an overview of their operation, what products are provided, and any other general information they wish to share. Participants will then be asked a series of semi-structured, open-ended questions that relate to CTE programs and the needs of the employer. The interview will be audio taped, and the recording will be downloaded to a computer for analysis. Written notes will also be taken to use as a guide to the audio recording.

Individual Interview Questions

1. What is your role in hiring and deploying graduates of local CTE programs? CRQ
2. What issues prevent graduates of CTE programs from beginning work immediately? CRQ
3. What skills do new CTE graduate employees possess? SQ1
4. What skills are needed to be prepared for entry level employment? SQ1
5. What learning experiences are needed to perform the work at this location/workplace? SQ2
6. What type of skills/abilities should CTE students be taught? SQ2
7. What technical skills are taught by CTE programs that are not relevant to the needs of this location/workplace? SQ2
8. When you see an applicant that holds a CTE degree, what do you think? SQ3
9. What is your impression of community college CTE programs? SQ3
10. What else would you like to contribute to this study on preparation of graduates of college CTE programs?

The questions used in qualitative research are open-ended, few in number, and are designed to generate views and opinions from study participants. This exploration of participant experiences using broad questions is designed to enhance researcher understanding of the phenomenon being studied (Creswell & Creswell, 2018; Creswell & Poth, 2018). Question one is an introductory question that lays the groundwork for the additional questions by establishing the participants' relationship to the phenomenon being studied and aligns with participant qualifications that are discussed in the recruitment plan section. Question two introduces the phenomenon by allowing the participant to discuss general issues with hiring CTE Industrial Systems Technology (IST) graduates.

Questions three, four, and five begin to narrow the focus on the phenomenon by discussing specific skills that are needed by graduates to be successful in the workplace. Employers consistently mention that new employees often do not possess the skills needed to immediately begin working independently. The questions associated with SQ1 are designed to explore what participants believe are necessary work skills, and their perception of the actual skills possessed by IST graduates. These questions reference specific experiences of the participants (Roberts, 2020).

Questions six, seven, and eight are designed to explore participant perceptions of the curriculum of CTE IST programs. Alignment issues between program curriculums and the needs of employers is a major theme of this study and also aligns with the CRQ. If there are gaps in the alignment between program outcomes and employer expectations, the experiences employers have with program graduates will be negative. Negative interactions will reinforce community college and CTE bias that states CTE programs are not as academically rigorous as traditional college and are not a reliable pathway to technical employment.

Questions nine and ten are designed for the researcher to explore employer perceptions of community colleges in general and their view of CTE programs. Potential bias by the participant may be revealed through these questions, allowing the researcher to determine if the participants issues with CTE IST graduates is with skills, with community college in general, or a combination of both. Community college and CTE bias is important to address because it impacts the employment of program graduates and the willingness of local industry to work with community colleges and CTE leaders in apprenticeships programs and industry advisory panels.

Individual Interview Data Analysis Plan

The purpose of interviews is to provide the researcher with the data needed to gain an in-depth understanding of the phenomenon being studied (Creswell & Creswell, 2018; Creswell &

Poth, 2018; Lester et al., 2020). The data obtained will be prepared for data synthesis by preforming a thematic analysis, which is used to establish patterns or themes drawn from each participants' experiences, analyzing what the participant said or wrote during the individual interviews (Creswell & Poth, 2018; Lester et al., 2020). Interview data will be analyzed in three phases (Figure 1), which will prepare the data to be merged with focus group and document data in the final study data analysis.

The first phase, or phase one, begins with data preparation and organization, and includes bringing all materials, such as notes and recordings into a single location and converting the data into electronic formats for future analysis and transcription. Since all data cannot be used, data will be categorized by relevance and whether it is applicable to the research questions. The second step of the phase one is data transcription. Spoken data is organized and converted to transcripts, which allows the researcher to prepare for coding and analysis. Transcription leads to the third step of phase one, which is initial analysis, where the researcher becomes familiar with the data that has been organized and transcribed. This step also may reveal gaps in the collected data that require additional collection efforts (Creswell & Creswell, 2018; Creswell & Poth, 2018; Lester et al., 2020).

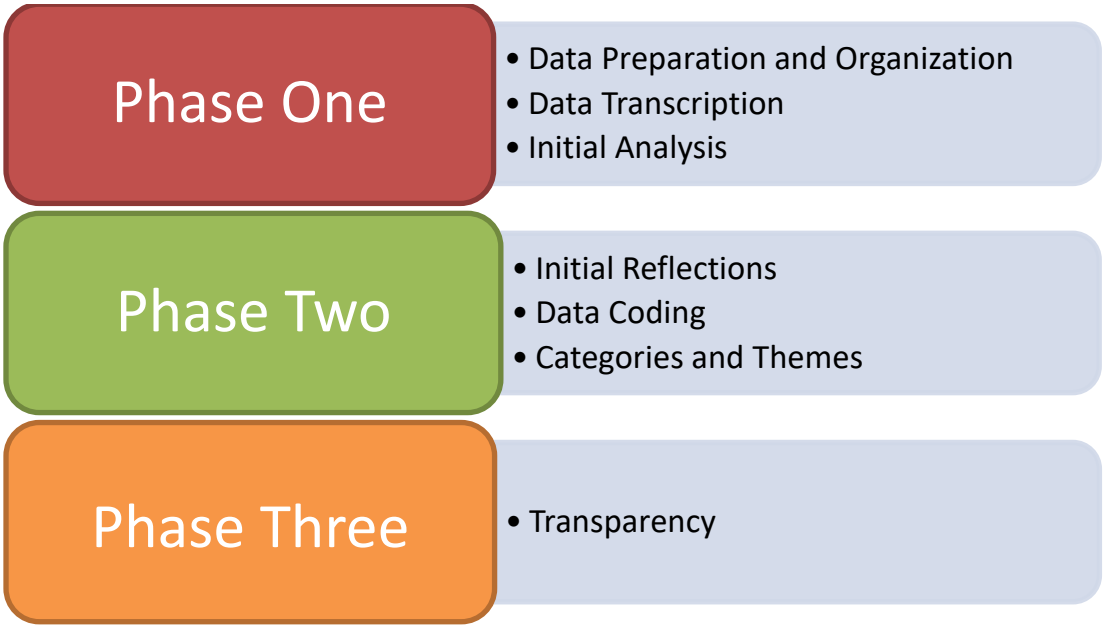
Phase two begins with initial reflections about the data. After the data is organized and transcribed, this initial analysis will be used to note early understanding of the data and potential themes. The second step of phase two is data coding. Codes are short, descriptive words or phrases that assign meaning to the data and the researcher's specific points of interest (Lester et al., 2020). Codes are expected to emerge during the data analysis process and fall into three broad categories. First, there are expected codes that represent common topics that a reader would expect to find. Second, there are surprising codes that were not anticipated prior to the

collection of data. Finally, there are conceptual interest codes that are not common but are of interest to the reader (Creswell & Creswell, 2018). The final step of phase two is the creation of categories and themes. Coding is the first step of the analysis. After the data has been coded, categories are created based on how the codes related and interacted with one another. After the categories have been developed, organization of the categories will produce themes, which will be used to answer and support the central research question (Lester et al., 2020).

The final phase, phase three, is transparency, which assures that the analysis process is transparent and verifiable. First, a detailed audit trail will be used to show the relationship between data sources, codes, categories, and themes. The interpretation of data and coding will be clear to a study reader and will help to build study trustworthiness (Lester et al., 2020). Transparency in each data collection method will lead to reliable triangulation, which uses themes from several data sources to build a justification for the themes that are used to support the central research question and sub-questions (Creswell & Creswell, 2018).

Figure 4

Individual Interview Data Analysis Phases



Notes: Phases one, two, and three represent a step-by-step approach to data analysis. These phases provide a systematic approach to interpreting qualitative data and may overlap (Lester et al., 2020).

Focus Groups

The second data collection method that will be used is a focus group. The purpose of a group is to bring together study participants that have similar backgrounds and experiences and conduct discussions on a specific topic or phenomenon (Creswell & Poth, 2018). Focus groups reinforce and supplement the experiences described in the individual participant interviews. The use of a focus group may produce additional descriptions of the phenomenon by grouping individuals that have similar backgrounds, needs and experiences. This type of interview approach may also be beneficial when the individual interview data is limited or one-on-one participants were hesitant to provide information (Creswell & Poth, 2018). The focus group participants will be randomly from a pool of previously qualified individual interview participants. The study goal for the focus group is 6 participants. The focus group session will take place at a neutral location convenient to those who agree to participate. The use of pseudonyms will be continued for this group interview session and the previously assigned pseudonyms from the individual interviews will be used. The focus group will answer 5 semi-structured questions, using a round table style format.

Focus Group Interview Questions

1. What are the advantages and disadvantages of hiring a CTE graduate? CRQ
2. What is the skill level and ability of a new CTE graduate employees? SQ1
3. What are your experiences with new employees that do not have a CTE degree from a community college. SQ2

4. How do the skills taught at community college CTE programs help your business reach its production goals? SQ2
5. What are your experiences with CTE graduates of the school closest to you place of business? SQ3

The questions created for the focus groups are intended to provide validation for the questions asked in the individual interviews (Creswell & Poth, 2018). The first question is designed to immediately focus the participants on their experiences with CTE graduates and is aligned with the central research question. Since there are both positive and negative experiences with hiring any new employee, this question provides participants an opportunity to express a broad range of experiences. Questions two is designed to explore the skills that employers expect new CTE employees to possess (SQ1). The focus group setting will provide an opportunity to see if there is disagreement among the participants as to what constitutes a skilled employee. Questions three and four are related to the curriculums that community colleges use to teach CTE (SQ2). Questions three is designed to explore the validity of a CTE degree and if new employees with a CTE degree have a higher level of skills then a new employee that might have practical skill but has not completed any, or little, post-secondary education. The final question is designed to see if participants have a local community bias (SQ3). Participants may note that new hires have a skills gap with what is taught in CTE programs, but may be dismissive of that gap when it is applied to the local community college, where the employers often have relationships with instructors.

Focus Group Data Analysis Plan

Analysis of the focus group data will be similar to the analysis of the data obtained in the individual interviews. Focus group data can be challenging to interpret because of the amount of

data collected, from the interactions of several participants, is usually quite large (O.Nyumba et al., 2018). Data collection will be obtained using multiple digital recording devices and researcher notes to assure that all participant experiences are captured (Creswell & Poth, 2018). Data analysis for the focus groups will involve two stages of data coding. The first stage will be initial coding which will categorize keywords, indications of themes and potential relationships between ideas. The second stage will be focused coding where extraneous data will be removed, similar categories will be combined, and connections will be made between recurring ideas and themes. Information will be organized into categories to identify patterns that were created during the focus group interactions. After the data has been organized, connections will be made to the central research questions, sub-questions, and the data already acquired from the individual interviews (O.Nyumba et al., 2018; Creswell & Poth, 2018).

Documents

The third data collection method will be the collection of documents. Qualitative studies primarily depend on interviews with individuals, but documents may also be used to collect related data (Creswell & Poth, 2018). The use of documents in this study will help to determine if the expectations of individual stakeholders align with the stated philosophy of the company they represent. Documents will be drawn from official participating business documents and a request for access to these documents will be made prior to the beginning of the interview process (Cresswell & Poth, 2018). Documents will be edited/redacted to remove specific company identifiers. To avoid issues with privacy, only documents that are non-specific to an individual employee, e.g. performance review will be requested. The following types of documents will be requested for examination

Types of Documents

1. Technician Job Description
2. Advertisements for the technician position listing preferred skills
3. Internal training documents
4. Internal training curriculum
5. Employee advancement/promotion pathways with required skills

Document Analysis Data Analysis Plan

There is no expectation of specific data to be generated from the collections of documents from each employer (Cresswell & Poth, 2018). The documents will be used to explore the requirements that the company expects new, skilled employees to have and the perception by the primary stakeholders of those expectations. While employers often state that there is a skills gap between CTE programs and employer needs, does that gap also exist in the documents that discuss skills from new employees? Documents may be effectively analyzed using thematic analysis, with a reflexive approach. This approach emphasized researcher subjectivity, and an analysis of documents that describes the skills that an employer is official seeking requires researcher bias to able to determine what skills are directly related to CTE programs and the graduates that may become employed (Morgan, 2022). Documents will be organized by type, and coded to determine common themes (Lester et al., 2020). Emerging themes will be compared to themes that emerged from the individual interviews and focus groups to discover if there is alignment of expectations.

Data Synthesis

Once the interview process has been completed, data will be analyzed and synthesized to discover prevalent, over-arching themes. A phenomenological study uses examines prominent

statements, comments and experiences and combines them into a description of the studied phenomenon (Creswell & Creswell, 2018). Qualitative data analysis software such as NVivo will be used to organize and code data, assist in comparing data and provide a visual representation of common themes. Once themes are established, an exploration of the data will be conducted to discover if there are issues between the expectations of employers and the skills that CTE graduates are being taught in the classroom.

Trustworthiness

Qualitative research constructs reality and does not provide validity using the same methods found in quantitative research (Stahl & King, 2020). The goals of quantitative research are rigor and validity, while the goals of qualitative research are credibility and trustworthiness (Cope, 2013; Creswell & Creswell, 2018; Stahl & King, 2020). Lincoln and Guba (1985) established the criteria that is commonly used to evaluate qualitative research. They proposed that credibility, dependability, confirmability and transferability would take the place of the quantitative internal validation, external validation, reliability and objectivity (Creswell & Poth, 2018; Lincoln & Guba, 1985). To meet the criteria of trustworthiness, Lincoln and Guba (1985) proposed a research methodology that included in-depth research in the field, the triangulation of data sources, methods and investigators as a means to establish credibility. By auditing the research process, credibility, dependability, and confirmability can be stablished in a qualitative study (Cope, 2013; Creswell & Creswell, 2018; Creswell & Poth, 2018; Stahl & King, 2020).

Credibility

A study that has credibility will properly represent the data, the participants views, and interpret the data obtained in a truthful manner. Credibility is a construct, created by the researcher and the reader (Cope, 2013; Lincoln & Guba, 1985; Stahl & King, 2020). Lincoln and

Guba (1985) recommended several techniques designed to assure study credibility. First, triangulation will be used to assure that study themes are properly aligned. This study will use data triangulation, which is the use of more than one type of data to establish themes and findings (Lincoln & Guba, 1985; Stahl & King, 2020; Creswell & Creswell, 2018). The data types sourced for triangulation are individual interviews, focus groups and document analysis. The second technique this study will use for credibility is peer debriefing. Peer debriefing recruits another person to review and question the study to assure that the research will engage others, beside the researcher, and provides an unbiased reaction the research procedures and findings (Stahl & King, 2020; Creswell & Creswell, 2018). This process will involve a reader recruited by the researcher and the input from the dissertation committee and qualitative research director (*Qualitative Dissertation Template*, n.d.). It is important that the data gathered for the study is complete and accurate. An effective way to assure credibility is to seek participant feedback, as part of the study validation process. The final technique use for credibility is member checking. Member checking is a method by which participants in the study review their contribution to the interview process for accuracy and proper interpretations (Creswell &Poth, 2018). The purpose of this method is not for participants to analyze raw data, but to examine the work in progress to verify major theses and findings. This process may also involve follow-up interviews to provide participants with the opportunity to comment on the findings. Member checking prevents the researcher from mis-interpreting the experiences of the participants and drawing wrong conclusions (Creswell & Creswell, 2018; Lincoln & Guba, 1985; Stahl & King, 2020).

Transferability

A study that has transferability has findings that can be applied to other research studies, and has application in other contexts (Cope, 2013; Lincoln & Guba, 1985). Transferability is achieved when the researcher provides sufficient information and context to allow the reader the ability to determine if the studies procedures and outcomes are transferable (Cope, 2013). Transferability is communicated using thick descriptions that provides detailed information about the studies setting, context, participants, durations, and thematic perceptions (Creswell & Creswell, 2018; Lincoln & Guba, 1985; Stahl & King, 2020). Effective transferability has results that individuals that are not involved with the study, can associate with their own experiences (Cope, 2013). The researcher will provide thick description to assure readers can share in the experiences of the participants and see validity in the central research question.

Dependability

Dependability is created using an audit trail that allows the study to be inspected by a peer, who would determine that the data acquired would be able to be replicated under similar conditions (Cope, 2013; Creswell & Creswell, 2018; Lincoln & Guba, 1985; Stahl & King, 2020). An audit trail documents the study process by keeping a research log, maintaining a data collection timeline, and recording the procedures used for data collection. Elements of an audit trail include 1) raw data, which includes transcripts, audio recordings and documents, 2) data analysis products, which includes notes, concepts and summaries, 3) data reconstruction products, which includes themes, finding and conclusions, 4) process notes, which includes procedures, design and rationale details, and 5) instrument development, which includes the development of questions, drafts and notes (Lincoln & Guba, 1985). To further assure

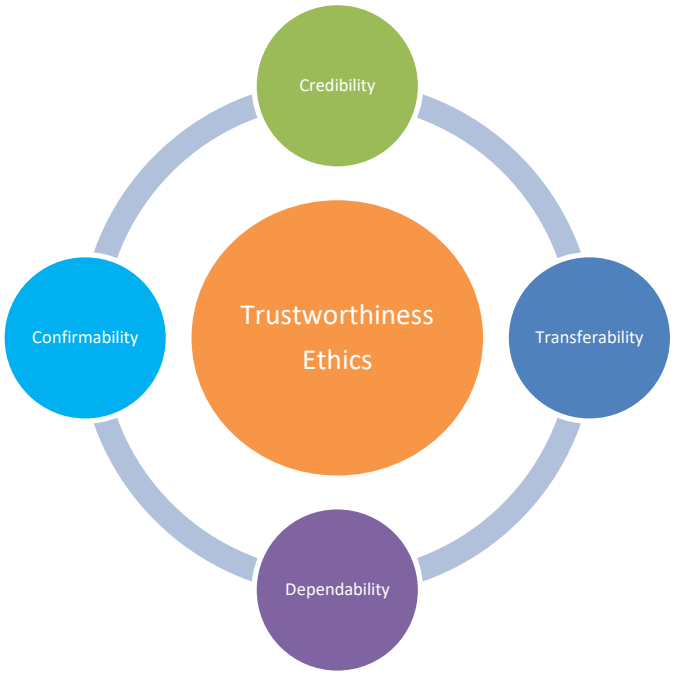
dependability, reflexive auditing will be used to assure that researcher biases are clear and monitored (Creswell & Poth, 2018; Stahl & King, 2020).

Confirmability

Confirmability is achieved when the researcher is able to demonstrate that the data represented in the study is consistent with the participants' responses and not influenced by the researchers bias or viewpoints (Cope, 2013; Stahl & King, 2020). Confirmability is aligned closely with credibility and dependability, using both triangulation and material audits to demonstrate unbiased participant reporting (Lincoln & Guba, 1985). The researcher establishes confirmability by describing how conclusions and interpretations were determined and demonstrating that that findings were taking directly form the data (Cope, 2013). While qualitative research acknowledges researcher bias exists and influences the study, neutrality, not researcher bias, should influence study outcomes (Lincoln & Guba, 1985).

Figure 5

Trustworthiness in Qualitative Research



Note: The naturalistic approach to qualitative research. Compiled from Lincoln, Y. S., & Guba, E. (1985). *Naturalistic inquiry* (1st ed.). SAGE Publications.

Ethical Considerations

Performing research in an ethical manner is an integral part of trustworthiness. Ethical considerations must be considered for all phases of the study (Creswell & Poth, 2018). The researcher should anticipate potential ethical issues during the research process. Each phase of research has its own ethical issues and appropriate ways to address those issues. The researcher should be prepared to respond to ethical issues prior to conducting the study, at the beginning of the study, while collecting data, during the analysis of data and when reporting, sharing and storing data (Creswell & Creswell, 2018). The purpose of preparing for ethical issues at each stage of the research is to ensure the accuracy of the findings, to protect the rights, privacy, anonymity, and experiences of the research participants and to protect intellectual property rights (American Psychological Association, 2022). Because participants are providing personal insight into their experiences with a specific phenomenon, and because this insight could have repercussions if revealed to persons not involved in the study, protecting establishing trust and assuring participant privacy is critical to study success (Creswell & Poth, 2018).

To assure that ethical considerations are appropriately addressed, this study has adopted an ethical compliance check list, compiled from recommendations found in the American Psychological Association (APA) publication manual (Table 3). An ethics checklist provides the researcher ethics guideposts to assure that ethical considerations are being considered at each stage of the research process. Using an ethics checklist, drawn from an ethics code, assures that the principles of integrity, fidelity, responsibility, and scientific respect are part of the foundation of the research study (American Psychological Association, 2022; Creswell & Creswell, 2018).

An ethical study is one that the researcher has considered and addresses all possible and evident ethical issues that are and may be part of the research process (American Psychological Association, 2022; Creswell & Creswell, 2018; Creswell & Creswell, 2018). This study will be conducted in an ethical manner by identifying the research objectives verbally and in writing, by obtaining permission to perform the study from the IRB, by obtaining permission from all participants prior to engaging in interviews, by keeping verbatim transcripts of interviews and all original media sources, and by providing unbiased interpretation of data obtained from participants, and analyzed documents (American Psychological Association, 2022; Creswell & Creswell, 2018).

Table 3

Ethical Considerations

Ethical Compliance Checklist
• All published and unpublished works, ideas, concepts and intellectual properties are properly cited. Any needed permissions for publishing have been obtained. • Institutional Review Board permission has been obtained prior to beginning research with human participants. • Informed consent for each participant has been obtained without coercion or pressure. • Researcher will review manuscript and is responsible for all content. • Confidentiality of all participants, who were sources of data for the study, has been assured. • Only participant data that has been consented to has been shared. • Conflicts of interest and researcher bias will be revealed. • Participant experiences are accurately reported, without researcher bias.

Note: Compiled from APA ethical considerations American Psychological Association. (2022). *Publication manual of the American psychological association* (7th ed.). APA.

Summary

The purpose of this chapter was to examine the study design, research questions, setting, participants, the researcher's role and relationship to the study, data collection and analysis procedures, frameworks, assumptions, and study trustworthiness. The purpose of this phenomenological study is to examine what skills alignment gaps exist between graduates of Industrial Systems Technology CTE programs and local industrial employers. A phenomenological approach will be used to discover the shared experiences of these employers. Questions have been designed to support the central and sub research questions. The setting and site selection are designed to focus on industry located within Northeast Alabama. An interpretive framework using Social Constructivism has been choose to focus the study on the participants daily experiences. Procedures have been established to assure that the questions are valid and have approval from the Liberty IRB, and site permissions and participant consent will be obtained. Data will by synthesized using NVivo software and member checking will be used to assure that participant themes are accurately reported. Ethical considerations will be anticipated and addressed, with all original data being properly stored and available for inspection.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this phenomenological study was to examine what skills alignment gaps exist between graduates of Industrial Systems Technology CTE programs and local industrial employers. This study was used to examine what sort of skills a new employee, that had graduated from a CTE program, were perceived by employers to be competent in and what, if any, skills' deficiencies were perceived to exist. These experiences were developed through in-person interviews and a focus group, where participants were given the opportunity to share both opinion and experience. The purpose of this chapter is to present the results of my data collection, and allow the voice of each participant to be heard. This chapter includes participant descriptions and data, the results section, which presents themes and sub-themes, outlier data and findings, research questions and data correlations, and a summary.

Participants

Participants were drawn from local industry located in Northeast Alabama. All participants supervised graduates of CTE programs, specifically those aligned with Industrial Systems Technology or equivalent curriculums, and participated in the hiring and training of these employees. Each participant had been in a maintenance, supervisory position for at least one year, and had a minimum of eight years of technical experience. Each participant possessed the technical knowledge needed to evaluate the knowledge possessed by CTE graduates that they employed, and this experience was verified using a pre-screening questionnaire (Appendix C). There was a total of 13 participants, which was a sufficient sample size to reach saturation. When no additional information that adds to the study data is being discovered, the study is considered

to have reached saturation, and additional participants are no longer needed (Creswell & Poth, 2018; Mthuli et al., 2021).

Response to study inquiries were positive, and the majority of the interviews were held at the participants' places of employment. Because the criteria for participation in the study was based on technical knowledge and managerial experience, specific demographics beyond years in current supervisory role, whether a degree was obtained in a technical field, years of experience, and age were not collected. While all participants met the criteria for supervisory and technical experience, not all participants had obtained a college education (Table 4). Of those that did possess a college education, all but 1 held two-year degrees from technical schools or community colleges. Since all participants had direct experience with the hiring and supervising of graduates of a community college CTE program, the study was considered to have merit (Creswell & Poth, 2018).

Table 4

Employer Participants

Pseudonym	Years Supervising	Degree in Technical Field	Years of Experience in a Technical Field	Age
West	5	Electrical Engineering Technology	33	52
Dillon	3	None	15	45
Jonah	16	Electrical Technology	35	53
Gabe*	5	None	12	45
Alcott*	11	None	17	43
Milo*	5	Design Draft Technology	27	50
Zayden	15	None	27	56
Aston	8	HVAC Technology	27	51

Alden	2	Maintenance Technology	32	52
Lester	3	Electrical Technology	8	33
Ward*	3	None	35	61
Quaid*	2	Industrial Automation Manufacturing Engineering	24	44
Sam*	1	None	21	43

Note: * denotes focus group participant.

Results

This section contains the three main themes, Skills Deficiencies, Technical Degree Perceptions and Changing Technology, and associated sub-themes, Technical Skills, Soft Skills, Desired Skills, Community College Perceptions, CTE Degree Perceptions, and Training that resulted from the data obtained from in-person and focus group interviews. After analyzing, evaluating and coding transcripts obtained from these interviews, the primary themes of skills deficiencies, technical degree perceptions, and training were used to develop a textural description of the participants' lived experiences. Additional sub-themes were developed to provide additional data that supported the essence of the phenomenon that was experienced (Creswell & Poth, 2018). This section concludes by examining an outlier finding that was common to most of the study participants, but was not aligned with a specific research question.

Skills Deficiencies

All survey participants noted that there were skills deficiencies present with graduates of CTE technical degree programs. The prevalence of this theme supported the purpose of this study, which was to examine what skills alignment gaps existed between these graduates and local employers. This study defined skills as the ability to perform a specific task or job and possess the knowledge and work habits needed to support that ability (Alic, 2018; McGunagle & Zizka, 2020). While all participants noted that new CTE graduates had skills deficiencies, these

deficiencies were not necessarily viewed as a failure on the part of the CTE curriculum or instructors. Jonah pointed out that these types of issues were to be expected because, "90% of them [new graduates] have never been in an industrial setting." Employers understand that these graduates have been working in an academic classroom/laboratory, and have not had an opportunity to work directly in industry. Quaid said, "When you get out there in real life, you don't have a panel that's perfectly built by engineers inside a controlled environment…you come in here and you got wires hanging out everywhere. You don't know where to start." Alden noted that, "Laboratory work is so different than things on the floor…because once you get into any facility, they're going to be so different." Being able to work efficiently in an industrial setting, as Jonah pointed out, "for the most part, is experience. And other than school, life experience." Life experience, from an employer's perspective, usually means real world work experience. Milo said, "I don't know that we've hired anybody straight out of school in a technical position…they have to start at the beginning and get on a career path that leads to a technician job." Aston agreed and stated, "One of my main concerns is at least three to five years of some kind of electrical experience." These comments underscore the difficulties new graduates sometimes have when trying to find employment with a degree, but no industrial experience. Despite the desire for new employees to have prior experience, employers have an expectation that new CTE graduates will have skills deficiency. These deficiencies consistently can be divided into two sub-categories, which are technical skills and soft skills.

Technical Skills

When discussing technical skills, participants discussed the importance of understanding basic industrial theory and concepts. When questioned for clarity, participants generally defined technical skills as the ability to understand the components, language, and tools needed to

maintain an industrial system, and the ability to maintain more than one type of system. This definition aligns with current literature that defines technical skills as the ability to perform a particular, technically oriented task or job, and the ability to take these skills and transfer them to another task, as needed by the employer (Alic, 2022; Baird & Parayitam, 2019; McGunagle & Zizka, 2020). For employers, technical skills are not the same as theoretical knowledge. Jonah, who is familiar with some of the textbooks used in CTE programs, said, "Too much time is spent in books that talk about the skills we need, but do not provide the hands-on practice needed to develop those skills." He also noted that graduates that have primarily been taught using textbooks "can talk a good game, but when it comes to actually trying to do something, they just weren't willing to put their hands on something." Ward stated that there may be an overemphasis on theoretical knowledge, stating that students need to know "basic electrical, you know, circuitry, and blueprints…it's just the mechanical stuff." Hands-on training is very important to Quaid, who said, "To me the biggest deficiency is the hands on…some guys that do have degrees, I ask them to be able to check a three-phase motor, they can't do it."

Technical skill, as defined by the participants, begins with basic, or foundational skills. Gabe stated that a successful technician is proficient in "basic, general maintenance activities…simple things, such as taking things apart and putting them back together." Alcott echoed the same thought and noted, "They have the book knowledge, but they're not able to apply it hands on yet, because they haven't had to do it." Sam agreed, "I understand you can't expect someone to just be able to jump right in and know every little thing, but a lot of the small simple things, they just don't seem to get or seem to have seen before." The participants also associated basic skills with mechanical aptitude. Milo defined mechanical aptitude as "having the basic knowledge to use wrenches, being able to at least go out there and be able to use a

wrench or something and take stuff apart and be able to put it back together." He also noted that "Some of them [CTE graduates] just have lacking, basic mechanical skills." Ward agreed, "The hands-on skills are more [important] than the books."

To develop basic, foundational technical skills, CTE IST programs need to provide as much hands-on experience as possible. Lester stated that, "Training could be improved by taking things apart and then rebuilding it…that would give a lot more insight of the type of work they might be getting into." Zayden amplified this point, stating that, "Being able to put something together and be able to make it run, it gives them confidence in what they're doing." Quaid also said, "A lot of maintenance technicians do not have adequate training." Because CTE programs do not or are unable to provide sufficient laboratory experiences, students may not be prepared to immediately enter the workforce. Jonah noted that, "When a graduate comes into a new job, they say 'wow, this is nothing like what I've read about, and they have never seen the system or component they have studied in real life." Lester agreed with this point and said, "These manufacturing facilities have big, heavy duty equipment and when it fails, it has to be worked on, and you don't see that in the classroom right?" Before a graduate is ready to work on complex systems, they have to be familiar and comfortable with the basic fundamentals. Alcott noted, "The fundamentals are definitely important."

The perception of what constitutes fundamental skills varied among the participants. In most cases, fundamental skills simply meant hands-on versus theoretical experiences. Alcott stated, "The fundamentals definitely are important. I think that's where they [CTE graduates] have the advantage…get the fundamentals and then go get the real-world experience." Gabe suggested that fundamentals are "just basic mechanical aptitude, being able to work under pressure." For Ward, fundamentals mean basic troubleshooting skills, and noted, "that the

biggest thing we do here is diagnosing." Since each of the participants work in different industrial settings, that produce a variety of products, it is not surprising that there are different interpretations regarding what constitutes a skills deficiency.

Despite some variation on the definition of fundamentals, there was almost universal agreement on the importance of electrical training. Zayden declared, "Basically, we run into electrical problems everyday…there is a lack of practical knowledge among these [CTE graduates] on using electrical meters or anything we do to check power or motors, anything electrical." Sam also noted, "They [CTE graduates] don't know how to use basic tools." While different industry uses a variety of machines and systems to create products, all industry uses electricity and systems with electrical circuitry. Aston agreed and said, "It is preferable to have a technician with electrical experience…if they can have some electrical experience, the other parts are easier." Experience, however, is learned in the field and may not be effectively taught in a classroom environment. Since CTE programs are academic in nature, theoretical concepts may be emphasized over practical learning activities.

For most of the participants, properly understanding electrical systems goes beyond just learning theoretical concepts. West stated, "Electricity to me is more conceptual than visual or tactile because I cannot see current [electricity] going through there [a wire] …it's harder to wrap your mind around." Being able to conceptualize electrical concepts and apply them to real world situations is a necessary skill for the CTE graduate to be successful. Gabe explained that understanding electrical systems allows for quicker resolution of a problem. He noted that a new graduate needs to know, "Where to start with a meter? Where do I check here first? It's like they really don't know where start. That's one of the things I've notice for sure." The lack of tool competency creates immediate skills deficiencies. Quaid said, "Without the working hands-on

knowledge, it's really hard for anyone to come in and just go to work." Complex systems require high level skills that are difficult to teach in the classroom. Lester stated that, "A lot of people [CTE graduates] struggle with these systems or even how to work on them." The skills needed to interpret electrical issues go beyond technical knowledge. There is also natural, technical aptitude. Jonah noted, "Some people are born with a logical nature and some people aren't. You can teach some of it, but some of it, I don't know." West agreed and said, "I don't know either. How do you teach out of the box thinking?"

Soft Skills

When discussing skills deficiencies, issues with graduate preparation extend beyond technical and theoretical knowledge. The need to be able to communicate, collaborate, critically think, and work well with others was a primary issue for all participants. Skills that include technical knowledge but emphasize communication skills, interpersonal skills, writing skills, critical thinking skills, and work ethics are referred to as soft skills or 21st Century skills (Bradberry & De Maio, 2018; Koehorst et al., 2021; McGunagle & Zizka, 2020; Rebele & St. Pierre, 2019). While study participants did not expect new CTE graduates to be fully competent in all areas of study, they did emphasize the importance of communication as a way to learn. Dillon stated that, "Communication is vital…if you can't communicate, you are not going to be successful." Sam also said, "Communication is critical, it is almost more important to me than actually having the skills needed to repair the equipment." What is interesting is that an employer may hire a new graduate that demonstrates technical ability but has difficulty working with others. Milo noted that, "There is a lack of interpersonal skills with new graduates." Sam agreed and stated, "I can tell when there is going to be an issue with a new guy coming in who knows more than everyone else and can't communicate…I don't want to put them out there." What is

not evident is whether CTE programs are failing to develop these skills or if it is an individual issue. Milos added “It’s hard for me to say whether the school has improved, their [soft] skills. They could be improved from where they were before they started the program.”

Regardless if concerns with soft skills are individual issues or deficiencies in CTE curriculum, local industry participants noted that today’s CTE graduates often have problems with these skills. Gabe noted that, “A lack of these skills is one of the biggest hindrances to their [new employees] ability to progress, to get better.” When speaking of employee progress, participants defined progress as the ability to learn and apply new concepts. This learning, however, cannot occur if the employee does not engage with their coworkers. Ward said, “There is no such thing as a stupid question…because nobody in this world came to earth knowing anything until they learned. If you can’t find an answer, ask and I’ll find you an answer. We’ll call someone.” Of course, communication is more than asking for help, it is also being willing to learn and process new information. West noted that, “Listening skills are huge. We know they come in with basic knowledge, but we’re always trying to improve that part of it, but the employee has to be willing to learn, to listen.”

Soft skills also include intangible skills, such as motivation and work ethics. Dillon stated, “It is hard to teach somebody how to be a go getter. I don’t know how to teach that. You have to be self-motivated and you’ve really got to want to be successful.” Jonah agreed and said, “We’ve got to figure out some way to teach them how to work. The last two people I hired with [CTE] degrees lasted a month, just because they didn’t want to work.” Milo agreed and noted, “A self-starter, that’s hard to find, and you have to have someone like that in today’s world.” Sam said, “Showing up for work and being able to actually pay attention and be at work when you’re at work is something a lot of them they just don’t really care about.” In most cases,

employers want to assist new employees with these issues through training and mentoring. Opening lines of communication with new employees can be difficult, especially with today's technology savvy graduates. Ward stated, "It's hard to get them to open up to you, face-to-face. You can sit right next to them, never say a word, and text them and they will understand everything you are saying. That's the new world." Text communication, however, is not effective or practical in technical fields. Alden said, "I need people that have the ability to say, hey, I need help. That's the biggest thing…if they don't come back and ask questions, they are not going to be successful." Jonah added, "You have to be able to communicate in today's world. If you can't, you are not going to go very far."

When discussing soft skills in the in-person interviews and focus group, the skill that was most often referenced after communication was critical thinking. Taking the correct steps to repair a system, and approaching a problem logically is necessary to be successful in a technological environment. Jonah stated, "You have to be able to logically look at stuff as complicated as most of the machinery is today…the ones that are critical thinkers are the ones that move up and the ones that are your got to people that get promotions." Critical thinking is used to determine which issue should be handled and in what order. Dillon said, "Prioritization is important, they may be technically sound, but they don't know which step to take first." While critical thinking skills are often an issue with new CTE graduates, the participants did see a difference between degreed applicants and those that did not have a formal education. Milo stated, "I would give them [CTE graduates] an edge, although I don't know that it is extremely noticeable." When comparing someone from off the street and a CTE graduate, Zayden ranked the graduate "a little higher than average." Participants understood that while these skills are desirable, they are difficult to teach. Lester said, "I think there has to be some kind of natural

ability, you have to be able to adapt…they're technically sound but the communication and thinking is not there…these skills can be hard to learn." When comparing CTE programs teaching of critical thinking and soft skills in general, Milo noted, "It is difficult to compare because we've had some from different programs and I don't know if it is the person or the program. It is difficult to say."

Desired Skills

As part of the hiring process, each employer publishes a job description when recruiting new employees. To determine whether the skills deficiencies described by participants match the desired and advertised skills, participants were asked to describe the skills that were detailed in job advertisements. Participants were also asked to provide documents that were used by the company in the hiring process that listed the skill requirements for technical jobs. Finally, participants were asked to describe the skills that they thought a CTE student should be taught in order of importance (Table 5). Study participants also ranked graduate technical knowledge and preparedness on an informal 10-point scale. Technical knowledge and preparedness were defined as a new graduate's ability to immediately provide support for the employers' industrial mission. While participants emphasized specific skills as priorities, they also noted that, to be successful, new CTE graduates would have to be competent in multiple disciplines. Alden stated that, "We require everyone to be multi-skilled…but some are little more advanced in some areas than others." Lester agreed and said, "We need a broad range of skills to come out of the degree program, they need to know multiple skills." Several participants did note that their emphasis on a specific skill might be different than what another manufacturer might emphasize as important because each industrial employer provides unique products that use a variety of technical systems. Alden stated, "What we need might be different than the company across the road, or

another company may need that. We understand that, but we have skill needs that are specific to us…we know you cannot tailor your program just for us."

Table 5

Study Participants Ranking of Desirable Skills in Order of Importance and Graduate Preparedness Ranking

Participant	Desired Skills	Graduate Preparedness Ranking 1-10
West	1. Reliability 2. Electrical Skills 3. Communication	7
Dillon	1. Electrical Skills 2. Trouble Shooting Skills 3. Multi-Tasking	3
Jonah	1. Communication Skills 2. Critical Thinking Skills 3. Electrical Skills	4
Gabe	1. Electrical Skills 2. Critical Thinking 3. Networking Skills	3
Alcott	1. Mechanical Skills 2. Communication Skills 3. Reliability	4
Milo	1. Diagnostic Skills 2. Commitment 3. Electrical Skills	5-6
Zayden	1. Hands-on Skills 2. Mechanical Skills 3. Communication Skills	7
Aston	1. Electrical Skills 2. Critical Thinking 3. Communication Skills	6
Alden	1. 2-Year Degree 2. Electrical Skills 3. Fabrication	6

Lester	1. Safety 2. Motor Controls 3. Electrical Skills	6-7
Ward	1. Diagnostics 2. Communication Skills 3. Electrical Skills	3
Quaid	1. Motor Controls 2. Communication 3. Print Reading	4
Sam	1. Work Ethic 2. Electrical Skills 3. Pneumatic Skills	3

Note: The desired skills ranking in this table resulted from discussions related to Individual Interview questions 4, 5 and 6. The Graduation Preparedness Ranking was the result of a follow-up question to Individual Interview question 2. Ranking is based on participants experiences with new graduates of CTE programs, with 1 being completely unprepared for the workplace and 10 being expert level of competence.

Desired skills are described by many companies as “Essential Functions” in their job descriptions and employment solicitations. The essential functions section of a job description lists the skills needed to perform the job successfully and provides the minimum requirements for employment. A review of essential functions, found in documents provided by the study participants, found that the skills discussed by the participants as areas of deficiency are listed within the job requirements. All of the documents collected, for example, required that a technician “perform electrical wiring, troubleshoot, install and maintain a variety of industrial systems.” The documents also mentioned soft skill requirements and stated that a new employee would be expected to, “use good judgement when making decisions and [being able] to effectively communicate with co-workers and team members.” Listed job descriptions also noted that a 2-year technical degree is either required or highly desirable. However, candidates that hold a 2-year degree may be difficult to find, in the current job market, and Zayden was quick to

point out that, “We want candidates with basic mechanical skills and a degree but right now we hire anybody, even if they have no maintenance experience or degree.”

The study participant’s descriptions of their experiences with new CTE graduates’ skills deficiencies demonstrated that there are skills alignment gaps between graduates of Industrial Systems Technology CTE programs and local industrial employers. While each participant had their own insight into these deficiencies, the skills that were needed for a new graduate to succeed were common to all employers. Technical skills and soft skills were both emphasized by study participants as an important part of a technical curriculum. To explore the commonality of desirable skills among the studies participants, a NVivo word frequency query was performed on this themes codes (Figure 5). The word query aligns well with the comments made by each participant and the skills ranking each participant provided.

Figure 6

Word Frequency Query Theme 1: Skills Deficiencies

Technical Degree Perceptions

Traditionally, community college degree programs have been viewed as academically inferior to those offered by four-year institutions. This perception has led to a stigmatization of community college opportunities and career paths (Gauthier, 2019; Kandalec Holm, 2019; Xue et al., 2019). Since CTE students do not usually intend to transfer to another school to complete a bachelor's degree, these students are perceived as less skilled than those who pursue higher levels of education (Gauthier, 2020a). When exploring employer experiences with graduates of CTE programs, this study also sought to discover what perceptions the participants had of community college education and technical degrees. Since negative perceptions might also lead to an inflation of skills deficiencies, it was important to discover how each participant viewed community colleges and A.A.S degree programs.

Community College Perceptions

The perception of community college is viewed as academically inferior to four-year institutions by the local community and employers is supported by current literature (Cho-Baker et al., 2021; Gauthier, 2020a; Kandalec Holm, 2019; Russell & White, 2020; Shaw et al., 2019; Xue et al., 2019). However, study participants did not report a negative perception of a community college education. Milo said, "I hold a community college degree myself, so I'm a little higher on it than probably most people." Alden noted, "That's where I got mine," and Dillon agreed and stated, "I think they're great, I've actually attended community college myself, so I know they're great programs." The perception of community college technical degrees as viable career pathways was expressed by several of the participants. Lester stated, "Personally, I think it's the way to go…I think you would benefit greatly from going through the hands-on classroom the stuff." Milo noted that perceptions of community college education seem to be

changing stating, “as far as a technical field, I think it’s more respected than it was a decade ago.”

As noted in Table 4, not all participants hold a college degree. Despite not having attended, or, in some cases, completed a community college education, their perceptions of community college were still positive. West stated, “I think it’s great. I don’t know much about community college but I think it gives a lot of people opportunities that they wouldn’t have otherwise.” Aston also viewed community college positively and noted, “I would say that I probably don’t have anything negative to say…it’s an outlet for people that may not have money that can go and get an education…technical classes help people learn how to grow up.” Alcott agreed and said, “I think it’s a great starter…If you don’t have to go straight to work out of high school, it’s definitely a foot up, you’re definitely kind of ahead of everyone else in your age bracket.” While all participants noted skills deficiencies in CTE program graduates, they did not associate those deficiencies with the overall quality of a general community college education.

CTE Degree Perceptions

Although participant responses to the value of a community college education were positive, discussions of the value of a CTE degree were more varied, with many participants expressing opinions on the practical value of a CTE diploma. Ward stated, “That degree is something you can hang on the wall, but until you show that you can perform it to me, it’s useless.” Quaid also noted that, “I really don’t look for a degree first, to me, hands on is absolutely the most beneficial thing.” Ward also said, “I don’t have a problem with the degree, but if I could get them straight out of high school and start to work and learn hands on to me that would be good.” Sam also noted a lack of concept depth with some graduates. “I’ve asked did you not learn any of this in your education,” he said, “In your schooling? And they say, well we had simulators, but nothing like this.” Negative perceptions align well with the discussion of

skills deficiencies, again emphasizing the participants desire to employ graduates with practical, hands on experience. However, it is interesting to note that participants that minimized the importance of a CTE degree all provided documents that stated a 2-year degree was required or preferred.

Other participant comments on the value of a CTE degree were more positive. Aston noted a degree's value because "it shows that they have the dedication to start and complete a program…but I do want to know what they have learned and what they have retained." Lester also noted that candidates that have completed a degree demonstrate commitment and said, "I think it shows a little more initiative towards having a career and having the drive to really set themselves apart from other folks." Participants expect, when seeing an applicant with a CTE degree, that they will possess some applicable skills. Zayden stated, "They're probably going to have some common basic knowledge...the only downside is that they may have been taught to do things differently than we do here." Aston noted that graduates seem to know the language of technical skills and said, "If they know the right words to say and can answer questions well, then I am initially impressed, but can they do the work?" Employers are looking for graduates that are able to begin work as soon as possible despite any skills deficiencies. Sam noted that, "if a guy has that degree, that's kind of expected of him to be able to fill that gap."

Employers are interested in degrees that are specific to their needs, even if the earned degree is technically focused. Sam noted, "When a two-year degree is on their resume, we ask very specific questions just to kind of gauge…did you take the class and did you learn something. What classes did you take?" Participants did note that CTE graduates did have additional skill sets that set them apart from non-graduates. Alcott said, "I notice they are more up to date with computers and computer literate…they are also more willing to adapt to newer

technologies than those who have been here awhile." Dillon noted, "Someone with a degree tends to be more organized." Interview skills, West noted, tend to be better for new graduates. "Folks that do have a two-year degree or greater," he said, "generally interview better than those who've had no formal education but have more experience…I think they're more prepared for interviews." Ultimately, however, participants continue to stress the hands-on, practical aspect of a CTE degree. Zayden said, "They're probably going to have some mechanical skills and at least know what an electrical meter is, even though they may not know how to operate it." Jonah echoed that statement, "For the most part, they all have a pretty decent foundation but, again, we go back to the first part of it. It depends on what they've actually ever done with their hands. You can only learn so much in the classroom."

Changing Technology

Participants acknowledged that some of the issues with skills deficiencies are due to rapidly changing technology. Ward noted that CTE programs may have difficulty staying current and stated, "Everybody's going to the new automated stuff…all that we have today, you have to understand how they work." Milo agreed and said, "One of the issues is just keeping up with the latest technology is hard." It is also difficult to address specific technological skills of a particular industry. West noted, "It's tough, we know that the program can't be tailor made just for us, it's hard to get a specialist." Zayden also discussed issues with specialty equipment and said, "A lot of our components are specific to us, in the past we didn't have all this electronic stuff." Quaid noted that when he toured a technical program at a community college he observed that their trainers and laboratory equipment were dated. Quaid addressed the issue with the instructor and asked, "Why are you teaching on the old equipment. I didn't beat them up too

much but out in the field, we're not using old equipment anymore…going forward, you try to get technicians that are more advanced than the older stuff."

Training

Participants were asked how they determined new employee skills and comfort with current technology. Responses were broad in nature, with some employers using formal processes for evaluation and training, and others using less structured approaches. Ward stated, "You know, one may be more mechanical than the other, more electrical or whatever, it's mainly trial and error but we want to get them together to work as a team." Aston noted, "It's learn as you go…that's really kind of how we work around here, and I'm sure that's not the best practice." Sam's company takes a more structured approach, and he stated, "We learn [what they know] by working with them…we can't just turn them loose, sometimes it takes a little time to figure out a few things about them and where they need improvement." Alden evaluates candidates using "observation, mostly observation, and it is trial and error too, but you observe it and kind of weed those that can't out." Participants also discussed the value of new employees learning to operate the machinery they have been hired to maintain and repair. Milo stated, "Typically, we have a process where they start out as operators, they learn the position and then jump over into maintenance."

Once deficiencies are identified, the participants were asked how they correct skill and technology issues. Dillon stated, "We encourage additional learning, we give them 3 hours a week of computer based and hands-on learning. It's designed to be fast but it's also designed for learning." Additional education opportunities are also scheduled off-site for employees. Ward said, "We will send them to extra schools for robots and stuff, to give them more hands-on opportunities." Zayden shared that his company uses an apprenticeship program for new employees and stated, "When we bring in somebody that we put in the apprenticeship program it

takes over a period for two or three years for them to become fully skilled." Training is an expected part of the process, although employers want graduates of CTE programs to be as skilled as possible. Sam noted, "Yeah, we offer a lot of good training. If we have an employee that needs some type of training, I'll send them, I'm all for it. I'll do what I can to help them get it." The effectiveness of training is dependent on the motivation of the employee to learn. Ward said, "You can only train a person if they want to be trained and you can only train a person if they're willing to do this type of work."

Outlier Data and Findings

There was one unexpected theme that was expressed by 3 participants that did not align with a specific interview question or major theme. All participants noted technical skills and experiences with these skills, as well as experiences with soft skills, such as communication and interpersonal relationships. Further, the questions were designed to emphasize potential issues in this area. However, all potential themes were not explored, and a universal theme, that would be agreed to by all participants, if directly asked, was mentioned only a few times in the interviews. This outlier theme is explained in this section.

Safety

Safety skills are often touted as the most important skills that an employee may have, and are also regulated by the U.S. Government, through federal agencies, such as the Occupational Safety and Health Administration (OHSA) (United States Department of Labor [OSHA], n.d.). An examination of documents collected from participants all noted the importance of safety in the workplace. Each company job requirements had a variation of the statement "[the employee] will perform work in a safe manner at all times." The documents also required that personal

protective equipment (PPE), which is used to protect employee's health in a variety of situations, is to be "worn and used at all times…with employees documenting use as directed."

Participants were not asked about safety, as a skills set, but comments were made about safety skills, independent of the interview questions. Quaid, when discussing skills new CTE graduate employees need for success in the workplace, stated, "First of all, how to work around electricity safely…if someone is scared, I know they are lacking practical experience." West also noted, that before a new employee begins demonstrating the skills they know, their safety skills must be evaluated. "First is safety orientation," he said, "no matter how technically skilled they are, we have to take them through orientation." Dillon also noted that at his facility "We make sure that they go through safety orientation, before we even let them go out on the floor." Given the importance of safety noted in the documents collected by the study, it is surprising that it was not mentioned by more participants. Unfamiliarity with safety issues can be dangerous for new employees. West noted, "New folks are so eager to do a good job that they're fire, ready, aim. This is a safety concern. We have to be sure the start out working safely."

Research Question Responses

To describe the experiences of employers with new graduates of CTE Industrial Maintenance style degree programs, research questions were developed to discover employer opinions, issues with skills gaps, how skills gaps are determined, and what are employer perceptions of the effectiveness of CTE college programs. Participant response to individual and focus group questions were used to develop themes that support the research questions, and the same responses also support the research questions directly. A selection of responses that support each research question will be presented in this section.

Central Research Question

How do employers of graduates of Industrial Systems Technology programs describe their experiences with these new employees?

While expressing issues with specific skills gaps with these graduates, participant experiences with program graduates were positive. West said, “Overall I think most programs are phenomenal, at least the ones that I’m familiar with...I’m happy with many of the skills that they have.” Skills deficiencies did not seem to damage views of CTE programs, in general. Lester noted, “Coming out of the degree side, you’re not going to be an expert, really in any field, but you are going to be well rounded, likely more so than someone without a degree…you have definitely a broader range of skills coming out of it.” Zayden, while also acknowledging various skills deficiencies, commented on the level of knowledge that graduates do have about some skills. “In some areas,” he said, “their knowledge is, you know, pretty much spot on.” Participants perceived graduates of CTE programs to be more likely to be willing to learn new tasks and more likely to finish what they start. Jonah noted, “These [CTE graduates] are the ones that are willing to put forth the effort and learn, they can turn into really good employees down the road, because they do have that background.” Sam agreed and stated, “It’s a good base [CTE programs], and good place to begin.”

Sub-Question One

How do employers of Industrial Systems Technology graduates determine new employee skills gaps?

Study participants had no difficulty discussing new CTE graduate employee’s skills deficiencies. It was a little more difficult to understand exactly how these deficiencies are determined. Often gaps are determined through observation of these new employees. Aston

stated that when he was hired as a technician, “I learned as I went, and some things I just didn’t know, sometimes you have to get someone to fumble their way through a system they are not familiar with.” Sam noted that, “Sometimes it takes you a little while to figure out a few things about them, and where they need improvement and what they’re good at…just working with them is the thing.” What is interesting is that several of the employers surveyed did not have a formal process to determine exactly what skills a new CTE employee has mastered, and where they may be uncertain or deficient. Ward stated, “Well, we just try them on some of the simpler stuff, and then just observe what they do and then we just graduate them to more complex systems as they learn them.” Alden noted that skill screening begins during the hiring process. “I’ve interviewed a lot of people over the last few years,” he said, “and I can tell when somebody is telling me the truth [about their skills] or they’re shooting me a line. I have an idea about their ability from the start.” All participants had some type of method to determine skills deficiencies in employees, with the majority using observation and monitored assignments. Aston stated, “I can’t have a supervisor standing over their shoulder…if they’ve been out their awhile, I’ll send someone to check on them and see if the problem is they don’t know what to do and won’t ask for help.”

Sub-Question Two

How do employers fill in new employee skills gaps?

Employers that were part of this study also vary on the methods used to help new CTE employees fill in and overcome skills gaps and deficiencies. In most cases new employees are considered to be in training and expected to need assistance with complex tasks. Zayden stated, “New employees struggle, so we try to train them up and teach them and show them [how to do the job].” Ward believed that learning comes from struggling with an unfamiliar concept.

"Maybe they don't know, so I might let them sit there for 4 hours and struggle" he said, "and then I will help them find the issue that they're not sure about." As noted previously, there is an expectation that there will be skills deficiencies that will need to be overcome. Milo noted, "The graduates we get, they're pretty much ready for training, so we work to get them up to speed." The documents examined for the study did not provide a lot of insight into an official, structured training policy. Two employers did provide documents that contained a maintenance skill training checklist that is used to help new employees track their progress as they develop new skills. The checklist described a skill such as, "insure the proper lock out and tag out procedures for each piece of equipment," the date demonstrated, and the observing supervisor. Forms like these are used to help track employee progress and may affect employee step raises. Dillon noted, "Skill training checklists allow for hands-on training opportunities and provide an opportunity for an employee to level up their skills." All participants stated that they provide different forms of training, either formal or informal, to assist their employees in becoming more effective in their jobs. Employers also noted that their technicians are often more comfortable with a particular skill set. Alden said, "Wwe require everybody to be multi-skilled but there's just some just a little more advanced in some areas than others…it doesn't seem like we ever get everybody on the same level, but I'll take those that are struggling and let them learn from the more skilled labor."

Sub-Question Three

What is the employer's perception of the effectiveness of CTE college programs?

Participants expressed positive experiences with CTE graduates, and also with the majority of CTE programs that they have trained their new employees. CTE college programs and community college in general both tracked well. Aston stated, "I would recommend for both

of my children to go to any community college, especially technical classes." Alden agreed and said, "Most technical community college programs are phenomenal, students seem to be excited about the things they are learning." Participants did note that they would like more communication between themselves and community college programs. "It helps when school put effort into trying to find out what we're doing, like what you're doing here," said Quaid. Positive experiences with CTE programs were prevalent, despite any issues with skills gaps. Alden noted, "When we get someone with a degree, they may not know something, but things start to click with them more quickly." While new employees with CTE degrees will have deficiencies, Dillon stated, "Graduates show that they're teachable, so, in my opinion, they are teachable." West agreed and said, "When I see a technical degree, I get excited. We have the potential for a good employee."

Summary

The purpose of this chapter was to report the results obtained from analysis of the in-person interviews, focus group discussion, and documents provided by study participants. Interviews and documents were coded for themes, and dominant themes were discussed. The first primary theme, Skills Deficiencies, was divided into three sub-themes, Technical Skills, Soft Skills, and Desired Skills. In this section, participants reported experiences they had with graduates of CTE programs, and the areas that graduates did not demonstrate full competency of skills. Specific skills deficiencies were discussed and ranked by participants in order of importance. The second primary theme, Technical Degree Perceptions, was divided into two sub-themes, Community College Perceptions and CTE Degree Perceptions. In this section, participants discussed their experiences with the community college system and CTE degree programs. Participants expressed their opinions on the quality of a community college education,

and the quality of a CTE degree. The third primary theme, Changing Technology, had a single sub-theme, Training. In this section, participants discussed their experiences with changing technology in their industry, and their perception of the effectiveness of the training that they provide. There was a single outlier data finding, Safety. In this section, several participants discussed the importance of safety training and skills, a theme that was not directly related to any of the interview questions. The final section in this chapter focused on the Central Research Question, and the studies three Sub-Questions. Participants experiences with graduates of IST programs as new employees, how they determined new employee skills gaps, how they filled those skills gaps, and their perception of the effectiveness of CTE college programs, were supported with data coded from the individual interviews and focus group. Documents were used to support and enhance the discussion of themes and provide study triangulation. While participants reported issues with skills and abilities of new CTE graduates, these deficiencies did not impact their opinion of community college or CTE degrees significantly.

CHAPTER FIVE: CONCLUSION

Overview

The purpose of this phenomenological study was to examine what skills alignment gaps exist between graduates of Industrial Systems Technology CTE programs and local industrial employers. Data was obtained by discovering how employers of graduates of Industrial Systems Technology programs describe their experiences with these new employees. An analysis of this data, collected through in-person interviews and a focus group, was coded into 3 primary themes, Sills Deficiencies, Technical Degree Perceptions, and Changing Technology The purpose of this chapter is to conclude the research and present my interpretations of the findings. Chapter Five consists of an interpretation of the findings, a summary of thematic findings, implications for policy and practice, theoretical and methodological implications, limitations and delimitations, recommendations for future research, and the conclusion.

Discussion

The purpose of this chapter is to discuss my study's findings, which are supported by the developed themes of skills deficiencies, technical degree perceptions, and training. Sub-themes include technical skills, soft skills, desired skills, community college perceptions, CTE degree perceptions, and training. Through the lived experiences of these employers, who experienced the process of hiring a new CTE graduate and integrating them into their working environment, I was able to discover skill alignment gaps that exist between CTE curriculums and the technical needs of local industry. This chapter presents my interpretation of these findings, implications for policy and practice, theoretical and methodological implications, limitations and delimitations, and recommendations for future research.

Interpretation of Findings

This section begins with a brief summary of thematic findings as discussed in Chapter 4 and will be followed by a series of interpretations that give voice to the participants' lived experiences. This study was used to address the problem that career technical instruction curriculum and training does not always align with the practical needs and technical requirements of local industry (Baird & Parayitam, 2019; Gauthier, 2020b; Giani, 2019). Interviews with stakeholders, who hire and interact with CTE graduates on a daily basis, revealed an expected skills gap between new graduates and the needs of the employer. What I hoped would be revealed by the study, however, was the specific technical skills that were deficient, and what steps could be taken by community college CTE instructors and curriculum writers to correct those deficiencies. What was interesting, and not aligned with current literature, was the view participants had of CTE programs and a community college education, in spite of perceived skills deficiencies and gaps. Discovering primary and underlying themes, within the comments by participants, not only addressed the problem statement of this study, but also provided concrete, applicable pathways to solutions.

Summary of Thematic Findings

The purpose and problem statements of this study were supported by the themes that were discovered by interviewing 13 individual participants and by conducting one focus group. Prior to completing the interview process, consistent themes begin to emerge, emphasizing issues with technical ability, communication, views of a community college education, and changing technology. The first primary theme to develop was skills deficiencies. All participants noted that new CTE graduates, who they employed, were deficient in one or more skills areas. The types of deficiencies described by the participants resulted in three sub-themes, which were

Technical Skills, Soft Skills and Desired Skills. Each sub-theme described specific skills deficiencies and the skills that were most desired and expected by employers. Technical skills were defined by the participants as basic, foundational skills that would be expected of all new CTE graduates. Gabe described technical skills as being able to take knowledge and apply it in the work place. A successful technician, Gabe said, should be proficient in "basic, general maintenance activities…simple things, such as taking things apart and putting them back together." Participants viewed the ability to take a hands-on approach to a problem as important as technical knowledge. Ward stressed the importance of hands-on working skills versus theoretical knowledge and said, "The hands-on skills are more [important] than the books." When discussing theoretical knowledge, almost all participants ranked electrical knowledge as most important. Aston summed up this viewpoint when he said, "It is preferable to have a technician with electrical experience."

The second Skills Deficiencies sub-theme was Soft Skills. Soft skills in CTE are defined as non-technical skills that include communication skills, especially interpersonal skills, such as the ability to communicate with co-workers, writing skills, organizational skills, critical thinking skills, and ethics (Bradberry & De Maio, 2018; Rebele & St. Pierre, 2019). Participants, when asked to share their definition of soft skills, almost unanimously referenced communication as the most important skill. Dillon stated that, "Communication is vital…if you can't communicate, you are not going to be successful." Participants noted that the types of jobs that new CTE graduates are hired for require communication skills as part of the screening process. An evaluation of documents provided by study participants universally required that, "A [new employee] would be able to effectively communicate with co-workers and team members." Participants also expressed the opinion that there is a generational issue with communication.

According to Ward, today's community college graduate is not comfortable with face-to-face communication. "You can sit right next to them, never say a word," he said, '[but if you text them] they will understand everything you are saying." Soft skills deficiencies also included issues, such as work ethic and critical thinking skills. Dillon stated, "[The ability] to prioritize is important, they may be technically sound, but they don't know which step to take first."

The third Skills Deficiencies sub-theme was Desired Skills. These were the skills participants described as needed by their specific workplace. In general, employers want employees that are competent in multiple disciplines. Alden stated, "We require everyone to be multi-skilled." Multi-skilled was defined, by participants, as the ability to shift rapidly from one technical discipline to the next, without having to seek assistance or additional training. These are skills that participants stated need to be taught as part of a CTE degree curriculum. Lester said, "We need a broad range of skills to come out of [any] degree program, they need to know a variety of [technical] skills." Participants understood, however, that their needs may not be exactly the same needs as another employer. Each employer in the study had one or more unique products. This created a need for a specific skill set, tailored for each employer. Of course, a CTE program can only emphasize a select number of skills and is not able to provide a custom curriculum based on the needs of an individual employer. During the discussion of this issue, participants noted that they did not expect that level of customization. Alden stated, "We know you cannot tailor your program just for us." Employers did expect that basic, universally needed skills would be taught. All employer documents required basic skills, such as the ability "to perform electrical wiring, troubleshoot, install and maintain a variety of industrial systems." The required skills listed in employer documents aligned well with the desired skills described by study participants (Table 5).

The second primary theme to develop was Technical Degree Perceptions. A review of literature described an ongoing, negative perception of a community college education. Degrees from these institutions, including CTE degrees, are often viewed as inferior to degrees offered by four-year institutions, and there is a stigma associated with community college opportunities and career paths (Gauthier, 2019; Gauthier, 2020a; Kandalec Holm, 2019; Xue et al., 2019). To discover if participants' view of community college impacted their experiences with graduates of these programs, interview questions (Q8 and Q9) were created to provide insight into how participants perceived the quality and value of a community college and CTE degree. These discussions revealed two sub-themes, Community College Perceptions and CTE Degree perceptions.

The first sub-theme, Community College Perceptions, revealed that perceptions of a community college education, by study participants, was not aligned with current literature that stated community college degrees are often perceived negatively (Cho-Baker et al., 2021; Gauthier, 2020a; Kandalec Holm, 2019; Russell & White, 2020; Shaw et al., 2019; Xue et al., 2019). Study participants, as a group, viewed 2-year degree programs as a viable pathway to career opportunities. Milo stated, "I hold a community college degree myself, so I'm a little higher on it than most people." Even participants that did not have any degree viewed a community college education positively. West said, "I think it's great [although] I don't know much about community college." However, while degrees were viewed as a positive, and are often listed as a preferred credential in employer documents, they still do not exceed the desire employers have for hands-on practical skills. Quaid stated, "I really don't look for a degree first, to me, hands on is absolutely the most beneficial thing."

The second sub-theme, CTE Degree Perceptions, revealed that, despite the skills deficiencies described by participants, CTE degrees are mostly viewed as beneficial. Positive perceptions of CTE degrees described work ethic over technical ability. Aston said a CTE degree has value because "it shows that they [the student] have the dedication to start and complete a program." Lester agreed and stated, "I think it shows a little more initiative towards having a career." However, with a degree comes the expectation that the potential employee will possess the basic skills needed to be successful in a technical workplace. Sam said, "When a two-year degree is on their resume, we ask very specific questions just to kind of gauge [what skills they possess]." Participants also noted that CTE graduates tended to interview better than those who do not hold a degree, and at least have gained some rudimentary skills. Zayden noted, "They are probably going to have some mechanical skills and at least know what an electrical meter is, even though they may not know how to operate it." Interestingly, even though most participants had a positive view of a CTE degree, there was no assumption of ability on the part of those who have obtained one. Ward summed up the general consensus of a CTE degree when he stated, "That degree is something you can hang on the wall, but until you show that you can perform it to me, it's useless."

The third primary theme to develop was Changing Technology. Part of the positive perceptions of community college and CTE degrees may come from the fact that employers acknowledge that technology is changing rapidly, and that they understand that CTE programs have difficulty staying current with their curriculum. Quaid noted that when he visited a community college and toured its technical laboratory, he noted that the technology being used to teach students was out of date. He asked the instructor, "Why are you using old equipment." Issues of funding and the purchasing of current, relevant laboratory equipment for CTE programs

is not addressed in this study, but participants do perceive that CTE programs are not able to keep up with the newest, advanced industrial systems. Milo agreed with this point and stated, "One of the issues is just keeping up the latest technology is hard." The discussion of changing technology led to one sub-theme, Training.

The sub-theme training revealed that employers have a variety of ways to determine what skills an employee does not possess and how those skills deficiencies are addressed. Approaches to training were both formal and informal, but it does seem that many employers take a haphazard approach to evaluating skills and correcting deficiencies. The most common way skills were evaluated was through observation. Alden stated that skill competency is determined through "observation, mostly observation…but you observe it and kind of weed those that can't out." Informal observation is an inconsistent way to evaluate performance. Ward stated, "It's trial and error…it takes a little time to figure out a few things about them and where they need improvement." This type of approach, to determine skill level and deficiencies, may result in exaggerating the level of deficiency of a new CTE graduate, and an underestimation of the skills the graduate does possess. Once a deficiency is identified, employers have different approaches to filling a skills gap. Aston stated, "It's learn as you go around here…and I'm sure that's not the best practice." Other companies have time dedicated for training opportunities. Dillon said, "We give them 3 hours a week of computer based and hands-on learning." The need for training is an expected part of the hiring process. Sam said,Yeah, we offer training. If an employee needs training, I'll send them, I'm all for it."

The thematic findings of this study supported the purpose statement, the problem statement and the research questions. The interviews and discussions, with study participants, revealed that the relationship between local technical employers and the community college's

CTE programs is important and nuanced. An exploration of these experiences and the resulting data led to three areas of significant interpretation, the expectations of deficiencies, the importance of soft skills, and that technology, used in industry, is changing rapidly.

Deficiencies are Expected. Deficiencies are so common in technical education that issues with skills gaps are acknowledged as a national problem. Legislation, such as the Perkin's Act, is designed to improve CTE program curriculums and change perceptions of the quality of education these programs are providing. (Blissett, 2020; Haviland & Robbins, 2021; Hodge et al., 2020; Malkus 2019). Extensive funding has been allocated for CTE and STEM programs in an attempt to improve graduate technical skill levels (McComas & Burgin, 2020; McGunagle & Zizka, 2020; U.S. Department of Education, n.d.). Despite increased funding for technical programs, employers report that graduates still lack practical skills, and instead, possess a selection of skills that may be highly regarded in academia but are not useful in the workplace (McComas & Burgin, 2020; McGunagle & Zizka, 2020). There is also an emphasis on stand-alone credentials and certifications to demonstrate to employers that specific skills have been learned. Employers, however, have stated that there are discrepancies in the quality of these credentials and certifications, and that they are inconsistent in their value for determining if an individual possesses a skill (Gauthier, 2020d).

Study participants did not hesitate to list issues with skills deficiencies during the interview process. Further, participants did not perceive these deficiencies to be particularly surprising or unexpected. Interestingly, some participants offered their own rationale for the existence of specific skills gaps. Jonah pointed out that "90% of them [new graduates] have never been in an industrial setting." Alden also noted that CTE laboratory experiences did not mimic the real world and said, "Laboratory work is so different that things on the floor…once

you get into any facility, they're going to be different." Participants seemed to understand that skills development comes from experience, not a classroom or a theoretical education. They also expressed the belief that it may take several years of post-education experience to become fully proficient in a skill. Aston noted that to become proficient in electrical applications, an employee would need "at least three to five years of electrical experience."

The expectation that new CTE graduates will have skills deficiencies is also rooted in participant belief that CTE students do not receive enough hands-on practical training. Jonah said, "Too much time is spent in books that talk about the skills we need but do not provide the hands-on practice." Issues with teaching technical skills in a practical manner are not new. The vocational training of the late 19th and early 20th century was often referred to as manual training. The focus on technical training of this period was practical in nature, with an emphasis on hands-on applications. Practical experience, instead of theoretical learning, was promoted by education intellectuals of this period, such as Calvin Woodward, James H. Stout, and John Dewey (Alix, 2019; Payne, 1906). Today CTE programs are designed to meet the skills needs of students that wish to obtain technical employment (Atwell et al., 2022; Gauthier, 2019). When it comes to skills deficiencies, study participants seem to still focus on traditional, hands-on learning activities as the best way to prepare for a technical career. Quaid said, "To me the biggest deficiency is the hands-on [learning]." Alcott stated, "They have the book knowledge, but they're not able to apply it hands-on yet, because they haven't had to do it."

This study has demonstrated that employer expectations of skills deficiencies is rooted in the way technical skills are taught by CTE programs. This is an important revelation because, if employers expected CTE graduates to have a lack of practical skills that will have to be taught by the employer, then the value of a CTE degree may be reduced. Sam emphasized this point

when he stated, “I understand you can’t expect someone to just be able to jump right in and know every little thing, but a lot of the small simple [hands-on] things, they just don’t seem to have seen before.” CTE instructors should not use the expectation of skills deficiencies of employers as an excuse to not improve and adjust CTE curriculums. Study participants were very clear that hands-on skills, even for new graduates, are just as, important then technical theory, if not more so. A successful CTE program will balance both practical and theoretical knowledge to produce a graduate that provides an immediate benefit for an employer. This study’s participants consistently emphasized the importance of hands-on, practical skills. Ward repeated the opinion of most participants when he said, “The hands-on skills are more [important] than the books.”

Soft Skills are Important and Deficient. Employers’ expectation that their employees be able to communicate and work with others is not surprising or unreasonable. Soft skills are usually included, in some form, with the CTE curriculum, but these skills are not usually emphasized by instructors, and the lack of soft skills by CTE graduates is being noticed by employers. Current research regularly rates the importance of soft skills over technical skills (Bradberry & De Maio, 2018; Burch et al., 2019). Because CTE programs emphasize technical learning and have limited credit hours available, soft skills training is usually presented in a single, one-credit course or as an elective (Hendricks, et al., 2021). Soft skills are also viewed as not as valuable as technical courses and not having a direct impact on employability by both students and instructors (Berdanier, 2021). This study’s participants emphasized the importance of soft skills, noting that communication was necessary for success. Sam said, “If they can’t communicate…I don’t want to put them out there.” Changing CTE program stakeholder’s perception of soft skills, and emphasizing its importance may help a graduate succeed in the

workplace and improve employer perceptions of program skills deficiencies (Berdanier, 2021; Hendricks, Myran, Katsioloudis, et al., 2021; Rebele & St. Pierre, 2019).

Study participants were clear that there are issues with new CTE employees and soft skills, especially communication and critical thinking skills. Their comments about soft skills, and how they defined these skills, aligned with what is referred to as 21st Century Skills. The primary skills associated with 21st century skills are operational skills, information management skills, communication skills, the ability to collaborate with others, creativity, critical thinking, and problem solving. A sub-set of 21st century skills also includes work ethics, citizenship, and community involvement (Koehorst et al., 2021; McGunagle & Zizka, 2020; (Sublett & Tovar, 2021). When ranking their top skills needed for success in the workplace (Table 5), all but one study participant listed a skill that falls under the definition of soft skills, with critical thinking and communication skills mentioned most often. The emphasis on soft skills by employers who need employees that are technically proficient, while surprising, aligned with the literature that emphasized the importance of these types of skills (Alic, 2018; Bradberry & De Maio, 2018; Koehorst et al., 2021; McGunagle & Zizka, 2020; Rebele & St. Pierre, 2019). Participants did note that it is difficult to determine if a CTE program graduate has been trained in soft skills concepts. Milos said, “It’s hard for me to say whether the school has improved their skills…they could be improved from where they were before they started the program.”

The importance of soft skills for employers was clearly revealed in this study. Unfortunately, soft skills are still under-emphasized by current CTE curriculums and are viewed as inferior to technical skills (Berdanier, 2021). Participants, however, repeatedly emphasized the importance and need for new CTE graduates to be able to understand and apply soft skills in the workplace. CTE instructors and curriculum creators must be mindful that soft skills are often

viewed as equally important as technical skills. Sam emphasized this point when he said, "Communication is critical, it is almost more important to me than actually having the skills need to repair the equipment." If CTE programs fail to understand the importance employers place on soft skills, then they will not be able to meet the current and future demands of the labor market (Sublett & Tovar, 2021).

Technology is Rapidly Changing. Participants in this study reported that one of the issues they have with keeping existing employees technically proficient is rapidly changing technology. Zayden said, "In the past, we didn't have all this electronic stuff, everything was mechanical." Assuring that the technology used to teach technical skills in the classroom is relevant and aligns with the needs of employers should be a priority (Boettcher, 2019). Participants noted that it is rare for CTE instructors to reach out to see if they can tour the employer's facility and discuss their technical needs and priorities. Quaid said, "It helps when schools put effort into trying to find out what we're doing." CTE programs will not be aware of changing technology in industry if they do not reach out to local employers for curriculum input and discussion. If industry leaders and CTE instructors and administrators work to collaborate on the type of technology needed to prepare employees for the workplace, then CTE instruction will stay current and relevant (Boettcher, 2019; Wrye et al., 2019).

Besides meeting with industry leaders to discuss changing technology, the use of apprenticeships would be a beneficial way for CTE programs to know what type of technology is being used in the workplace. Apprenticeships emphasize work-based learning that uses classroom instruction, on-the-job (hands-on) training, and mentorships to help prepare students to enter the work force (Anderson & Keily, 2021). Apprentices may act as a conduit for an exchange of information between industry and CTE programs. Further, students can access

current technology, even if it is not available in the classroom. Out of date, or obsolete technology, does not benefit the student, provide marketable skills, and increases the perception by employers that there is a skills gap, when in fact, it is a technology gap (Anderson & Keily, 2021; Gallup, 2020). Study participants noted that they were open to using apprentices as a means of improving hands-on skills. Zayden said, “We want people in an apprenticeship style program because it takes at least a couple of years for them to become fully skilled. It’s perfect for new employees.”

Study participants were very clear on how they view CTE degree programs, and the skills, both technical and soft, that they view as necessary for the success of their business. Skill deficiencies did not damage their view of CTE programs, but participants also want program instructors and administrators to engage with them and to be responsive to their changing technological needs. While deficiencies were the focus of this study, new graduates do demonstrate proficiency in a variety of skills. West said, “I’m happy with many of the skills they have.” Zayden agreed and noted, “In some areas, their knowledge…is pretty much spot on.” Obviously, program quality will vary depending on the school and the local industry being served, but the participants in this study reported a positive view of CTE programs and a willingness to work with CTE stakeholders to improve outcomes. As Sam said, “CTE programs are a good place to begin.”

Implications for Policy or Practice

The purpose of this section is to discuss implications for policy and practice. The experiences of employers of new CTE graduates creates an opportunity for improvement in CTE degree programs. The understanding that skills deficiencies not only exist, but are expected, emphasizes the need for CTE programs to be dynamic and responsive to the needs of local

employers. It is important for CTE policy and practice to align with employer understanding of what constitutes an effective curriculum (Dicker et al., 2019). This section presents suggestions for policy and practice that may help improve student learning outcomes and reduce the perception, by employers, that it is expected for a new CTE graduate to be deficient in foundational skills.

Implications for Policy

Federal and state policies supporting CTE have increased funding and educational requirements for the successful completions of a 2-year technical degree. At the federal level, the Perkins Act, specifically Perkins IV, changed the focus of CTE curriculum, and restructured it to increase academic standards and improve technical content (Giani, 2019; Perkins IV, 122(c)(1)(A)). At the state level, programs, such as *Strong Start, Strong Finish*, have been implemented to improve technical education and provide skills that are in demand by local employers. Apprenticeship programs are also being emphasized by both State of Alabama and the ACCS (The Office of Alabama Governor, 2019). Similar programs are being implemented by other states in an attempt to improve technical learning outcomes (Blissett, 2020; Haviland & Robbins, 2021; Hodge et al., 2020; Malkus 2019).

While the Perkins Act and STEM education initiatives have emphasized technical learning, the participants in this study noted a lack of soft skills in new graduates of CTE programs. STEM was designed to emphasis science, technology, engineering, and math in school, especially in secondary education. Although STEM does include problem solving skills, it does not provide an in-depth focus on primary soft skills, such as communication (McGunagle & Zizka, 2020; (U.S. Department of Education, n.d.). Just as the Perkins Act was designed to rebrand vocational school, and improve technical education, soft skills also need to be properly

emphasized and integrated significantly into the curriculum, including being placed within classes that are traditionally technical in nature. Many degree plans include a soft skills class, often referred to as Workplace Skills. However, this class is traditionally offered during the student's final semester and is only 1 credit hour. In some curriculums, skills classes are electives and are not promoted as an important component of a completed technical degree (Hendricks, et al., 2021). Soft skills training should be incorporated into the full CTE curriculum with a soft skills training module required for every class and an expansion of Workforce Skills classes' credit hours. Despite rebranding soft skills as 21st Century Skills, this type of training is still deemphasized by many CTE programs (Koehorst et al., 2021; McGunagle & Zizka, 2020).

Improving apprenticeship programs, through employer and college education outreach, may decrease graduate skills gaps by providing students the opportunity to work in real world situations while they learn in the classroom. Despite the emphasis on apprenticeship programs at both the state and federal level, many community colleges and employers are unaware of the benefits of these programs and how to implement one (Kardel, 2021). Study participants repeatedly stated that new graduates did not have sufficient hands-on training to be prepared to work in an industrial environment. Studies have shown that graduates have difficulty transitioning from the classroom to the workplace (Gauthier, 2020b). Apprenticeship programs use work-based learning, where the student spends time in both the academic and in the workplace. A relationship with an employer, that includes an apprenticeship program improves learning outcomes by allowing a student to get the hands-on training that employers prefer, as well as the theoretical knowledge needed to understand the principles behind the systems they are working on (Jacobs & Worth, 2019; Kardel, 2021; United States Government, n.d.). Policy makers, at both the state and federal level, need to continue to emphasize the benefits of

apprenticeship programs. Expanding tax benefits for industry that provides apprenticeship programs, and simplifying the application process used to create these programs, may increase the usage of these programs and improve the quality of CTE program graduates.

Implications for Practice

Study participants expressed that they had an expectation of skills deficiencies among graduates of CTE programs. To decrease these gaps, and improve program outcomes, it is important to assure that CTE programs are responsive to input from local industry leaders and are exposing students to as much real-world training as possible (Boettcher, 2019). In the past, CTE programs have used industry advisory partnerships as a way to learn the technical needs of local industry. Industry advisory partnerships are usually formal meetings, at a neutral location, where CTE stakeholders meet and discuss what skills should be emphasized, coordinating other learning opportunities (Gauthier, 2020c). However, Covid-19 limited the opportunity for these meetings to occur, and post-Covid, many advisory boards have yet to start meeting again.

While the advisory boards are still a viable platform for communication between industry and CTE programs, a more effective approach may be meeting with each industries' leaders at their place of employment. Study participants were very open to the idea of my meeting with them at their plant/factory. Often, after the interview process was over, plant managers took me on a tour to see the type of product they made, the type of systems they used, and the type of technology they expected to purchase in the future. Valuable information, that was applicable to curriculum design, was learned through observing the type of work that was being performed, and speaking informally with managers and employees. CTE instructors and curriculum designers should consider regular site visits to stay current on the needs of employers in their area and the type of technology being used. While more time consuming than a single, quarterly

meeting, the long-term benefits of having regular communication with individual industry may improve the quality of education of CTE programs.

One of the biggest issues for CTE programs is how to provide the hands-on training that industry continues to state it needs from technical programs. Traditionally, to provide hands-on experiences, simulations have been used to mimic what students may face in the real-world (Chernikova et al., 2020). Simulations, however, still take place in the controlled environment of the classroom and are not able to simulate environmental conditions, such as heat, dirt, and moisture. Study participants noted that new graduates of CTE programs were not prepared for the differences between the classroom and the workplace. Even when CTE programs and local industry have established an apprenticeship program, all students are not able to participate. To prepare students for a future workplace environment, regular class trips to local industry should be scheduled. These trips may include plant tours, meetings with managers and other employees, mock orientations, and exposure to the type of environments found at that workplace. These types of events would benefit both students and employers. Students would begin to acclimate to non-classroom environments, and employers would begin to develop relationships with future graduates. Interactions with employers and their workplaces should begin early in the program and occur regularly.

Theoretical and Empirical Implications

The purpose of this section is to address the theoretical and empirical implications for this study. This study used Kolb's Theory of Experiential Learning, which posits that learning is an active, not passive process, where students learn best by doing and then reflecting on the results of their actions. Skills are developed through a combination of processes that includes acquiring abstract concepts and then applying them to different situations (Kolb, 1984). This study,

through the lived experiences of the participants, demonstrated the importance of experiential learning and the value placed upon the skills developed from this pedagogy by technical employers. The empirical implications of this study add to the existing literature that implies that there is a skills deficiency between graduates of CTE programs and the employers that hire them. Further, the experiences of employers were described, filling an existing literature gap that has neglected to discover and develop employer skills gap perspectives.

Theoretical Implication

The theoretical framework for this study reveals that the experiences of employers of CTE graduates align with Kolb's Theory of Experiential Learning. Experiential learning emphasizes the use of experience to develop skills. Participant's experiences with these graduates revealed that there is a curriculum deficiency when evaluating the amount of time being spent in the classroom on hands-on activities. CTE curriculums use traditional lecture, laboratory exercises, and simulations to prepare students for entry into the workplace. However, participants consistently reported that the graduates they employ are demonstrating that they have not received enough real-world training and have not been exposed to the reality of an industrial work environment. The need for practical, not just theoretical soft skills training, was also noted by participants. The study's findings align with current literature that noted a need for technical and soft skills training. The gap in the literature, the excluding of employee experiences, was evident by the discovery that employers expect there to be skills deficiencies. This study adds to the research that supports the use of experiential learning and the use of scaffolding as an effective way to develop technical skills.

Empirical Implication

This study adds to the literature of phenomenological research by exploring the experiences of employers of CTE graduates. Previous studies have noted that employers often

emphasize experience over education (Gauthier, 2020b). This study diverged from current research by adding the voice of the employer to the research used to determine skills gaps and deficiencies. The value of experience over theoretical knowledge was revealed in the data of this study. By interviewing employers that were in close proximity to a community college, curriculum, CTE graduate quality, and competency was included in the data obtained from participants. While a degree is considered valuable, real-world experience and relevant soft skills were considered to be just as valuable and, in some cases, more valuable then theoretical experience. This study contributed to the literature examining skills gaps by determining specific issues that contribute to these gaps.

Limitations and Delimitations

Limitations to this study included participant availability and participant demographics. Participants in this study were very busy, often working extended shifts and weekends. Scheduling interview times, especially for the focus group, was difficult. Although all individual interviews were held in-person, scheduling issues required the focus group to be conducted via telephone. I was unable to use Zoom or Microsoft teams due to technology issues with individual participants. The inability to bring the focus group together in-person may have impacted participation, and the give-and-take that is common to group meetings was not present. Second, although this study was only focused on participant age, supervisory experience, and technical experience, it was noticeable that all participants had similar, secondary demographics. All participants were white males, of similar age and background, and had similar experiences with community college programs. A more diverse participant group may have emphasized different skill deficiencies, depending on their experiences with graduates of CTE programs and community colleges.

Study delimitations included a limited geographical area and a specific industrial profile. To create a study that was likely to engage participants with similar experiences, this study was limited to industry found within the Northeast section of Alabama. A larger study footprint would have made the in-person interview process more difficult. It is also noteworthy that industry closest to a community college within this region were more responsive than those that were not within close proximity to a school. The willingness of employers, that were close to a community college, to participate in this study suggests that industry stakeholders tend to associate education with the school that is closest. Second, this study focused on industry that uses similar technology to produce a tangible product. By choosing this type of industry, I hoped that experiences would be similar, given that employer needs would also be similar. However, graduates of CTE IST programs are also employed in other capacities, such as maintenance technicians at a hospital. It is likely that the skills deficiencies these employers might note would be different, although there would be the expectation that issues with soft skills would be similar.

Recommendations for Future Research

After completing my research, I believe additional research should be conducted with employers of community college CTE programs. Not only did employers that were contacted for this study respond positively to both the interviews and study goals, but relationships were established with local industry leaders that will benefit my students and the program. Future studies should emphasize going to the employer's work location so the researcher can see first-hand the type of work being done, and the types of technical systems that are being used. Further research targeting issues with soft skills would also be helpful to discover what aspects of communication employers view as deficient, and if this view is shared by participants. A study

that only examines employer experiences with soft skills would be appropriate, especially since participants ranked soft skills as high, if not higher, than technical skills.

Additional qualitative studies should be conducted to further explore employer experiences with new CTE graduates, especially after adjustments are made to the curriculum. One of the goals of this study was to provide data to other community colleges that have similar programs and desire to meet the needs of local employers. This study was limited geographically, but the data has broader implications. It would also be interesting to duplicate this study in a different region of the country to see if employer experiences are similar. A study that expands the participant group to include people of color and mixed genders would also be recommended. While a quantitative study may have revealed several of the same themes via survey, the expectation of skills deficiencies and the importance of experiential learning would not have been as easy to determine. The important themes of this study were developed through face-to-face conversation, which led to important conclusions. Community colleges with similar technical programs should interact with industry, within their sphere of influence, to develop interpersonal relationships that will improve student training and learning outcomes.

Conclusion

The purpose of this phenomenological study was to examine what skills alignment gaps exist between graduates of Industrial Systems Technology CTE programs and local industrial employers. This study was guided by Kolb's (1984) Theory of Experiential Learning, which stated that learning cannot take place without experience. The central research question of this study was, "How do employers of graduates of Industrial Systems technology programs describe their experiences with these new employees." A phenomenological study was used to determine what skills alignment gaps exist between graduates of Industrial Systems Technology CTE

programs and the needs of local industrial employers. A sample of 13 participants, and a single focus group, were interviewed to discover employer perceptions of CTE graduate skills, the quality of a community college education, and the type of skills that were necessary for success in a technical, industrial career path. Data were collected via recording, transcribed, and analyzed using NVivo software. Primary and sub-themes were identified and categorized. Triangulation was obtained using multiple data sources, document analysis, and peer debriefing. Member checking was also used to assure participant experiences were correctly reported. There were three primary themes, Skills Deficiencies, Technical Degree Perceptions and Changing Technology, that were revealed through the exploration of participant experiences. Participants emphasized experiences with skills deficiencies, technical degree perceptions, and changing technology. An outlier theme that was not related to the central research question was safety.

Participants expressed an expectation of skills gaps between their needs and the curriculum taught in a CTE program. A desire for an emphasis on hands-on training experiences was also stated. Despite an expectation of missing skills among graduates, participants still had an overall positive view of a CTE degree and a community college education. Issues with soft skills were also mentioned, with an emphasis on communication skills. There was also an understanding that changing technology in the workplace made it difficult for CTE programs to stay current with training exercises. The experiences of participants in this study suggests that changes to CTE curriculum, such as additional hands-on activities and additional soft skills training be applied. CTE program instructors and curriculum writers would benefit greatly by regularly visiting employer work places to examine new technology and receive feedback from frontline managers. Future research that expands sample size, and additional industries that use

CTE graduates, may discover data that supports the success of CTE programs and the students who obtain CTE degrees.

References

Ahn, J. N., Hu, D., & Vega, M. (2020). Do as I do, not as I say": Using social learning theory to unpack the impact of role models on students' outcomes in education. *Social & Personality Psychology Compass*, *14*(2), 1–12. https://doi.org/10.1111/spc3.12517

Alabama Community College System. (2019-2020). *Carl D. Perkins career and technical education act* (Policy and Proceedure Guidebook). https://www.accs.edu/wp-content/uploads/2021/05/2020-2021-ACCS-Perkins-Policy-and-Procedure-Guidebook-4-1-2020.pdf

Alabama State Department of Education. (n.d.). *Career and technical education*. Alabama CTE-Alabama state department of education. https://www.alabamaachieves.org/career-and-technical-education/

Alabama State Department of Education. (2022). *Alabama course of study career and technical education* (Curriculum Guide). https://www.alabamaachieves.org/wp-content/uploads/2022/08/Draft-2022-E_T-COS-8-1-2022.pdf

Alexander, D. L. (2020). Land-grant colleges and popular revolt: The origins of the Morrill Act and the reform of higher education. *Journal of American History*, *106*(4), 1060–1061. https://doi.org/10.1093/jahist/jaz731

Alic, J. A. (2018). What we mean when we talk about workforce skills. *Issues in Science and Technology*, *34*(3), 30–36. https://www.jstor.org/stable/26594262

Alix, S. (2019). The hand as agent of the mind? The irony of manual training reform in Menomonie, Wisconsin (1890-1920). *History of Education*, *48*(4), 479–495. https://doi.org/10.1080/0046760X.2019.1576236

American Psychological Association. (2022). *Publication manual of the American psychological association* (7th ed.). APA .

Anderson, L., & Keily, T. (2021). Statewide apprenticeships: Building pathways in community and technical colleges. *New Directions for Community Colleges*, *2021*(196), 97–105. https://doi.org/10.1002/cc.20486

Association for Career & Technical Education. (n.d.). *Why CTE?* Association for career & technical education. https://www.acteonline.org/why-cte/

Atwell, A., Ecton, W., Klein, S., D'Amico, M. M., & Sublett, C. (2022). Community college responses to align career and technical education programs with changing labor markets. *New Directions For Community Colleges***,** *2022*(197), 45–58. https://doi.org/10.1002/cc.20496

Baird, A., & Parayitam, S. (2019). Employers' ratings of importance of skills and competencies college graduates need to get hired**.** *Education + Training***,** *61*(5), 622–634. https://doi.org/10.1108/ET-12-2018-0250

Berdanier, C. P. (2021). A hard stop to the term "soft skills". *Journal of Engineering Education*, *111*(1), 14–18. https://doi.org/10.1002/jee.20442

Bettencourt, G. M., George Mwangi, C. A., Green, K. L., & Morales, D. (2021). But, do i need a college degree?: Understanding perceptions of college and career readiness among students enrolled in a career and technical high school. *Innovative Higher Education*, *47*(3), 453–470. https://doi.org/10.1007/s10755-021-09585-3

Blissett, R. (2020). *Why career and technical education? Exploring policymakers' expressed motivations for supporting Perkins V.* [Report]. American Enterprise Institute for Public

Policy Research. https://www-proquest-com.ezproxy.liberty.edu/docview/2417945065?pq-origsite=summon

Boettcher, T. (2019). Beyond industry partnerships: How postsecondary cte programs are achieving success. *Techniques*, *94*(7), 40–43. https://go.openathens.net/redirector/liberty.edu?url=https://www.proquest.com/trade-journals/beyond-industry-partnerships-how-postsecondary/docview/2309262978/se-2

Bradberry, L. A., & De Maio, J. (2018). Learning by doing: The long-term impact of experiential learning programs on student success. *Journal of Political Science Education*, *15*(1), 94–111. https://doi.org/10.1080/15512169.2018.1485571

Brunello, G., & Wruuck, P. (2019). Skill shortages and skill mismatch in Europe: A review of the literature. *Issues in Science and Technology*, *34*(3), 30–36. https://doi.org/10.2139/ssrn.3390340

Burch, F. G., Giambatista, R., Batchelor, J. H., Burch, J. J., Hoover, J. D., & Heller, N. A. (2019). A meta-analysis of the relationship between experiential learning and learning outcomes. *Decision Sciences Journal of Innovative Education*, *17*(3), 239–273. https://web-p-ebscohost-com.ezproxy.liberty.edu/ehost/pdfviewer/pdfviewer?vid=0&sid=5542adad-65b5-42ce-a7c4-4430242b038c%40redis

Burgess, R., & Akers, R. (1966). A differential association -reinforcement theory of criminal behavior. *Social Problems*, *14*, 128–147. https://www-tandfonline-com.ezproxy.liberty.edu/doi/full/10.1080/02732173.2012.646160

Chernikova, O., Heitzmann, N., Stadler, M., Holzberger, D., Seidel, T., & Fisher, F. (2020). Simulation-based learning in higher education: A meta-analysis. *Review of Educational Research*, *90*(4), 499–541. https://doi.org/10.3102/0034654320933544

Cho-Baker, S., Olivera-Aguilar, M., & Fishtein, D. (2021). Using latent class analysis to link career and technical education in adolescence and work and school transitions in young adulthood. *Career and Technical Education Research***,** *46*(2), 59–79. https://doi.org/10.5328/cter46.2.59

Clark, K. R. (2018). Learning theories: Constructivism. *Radiologic Technology***,** *90*(2), 180–182. https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=132750222&site=ehost-live&scope=site

Clark, R. W., Threeton, M. D., & Ewing, J. C. (2010). The potential experiential learning models and practices in career and technical education and career and technical teacher education. *Journal of Career and Technical Education*, *25*(2), 46–62. https://eric.ed.gov/?id=EJ931098

Cope, D. G. (2013). Methods and meanings: Credibility and trustworthiness of qualitative research. *Oncology Nursing Forum*, *41*(1), 89–91. https://doi.org/10.1188/14.onf.89-91

Creswell, J. W., & Creswell, J. D. (2018**).** *Research design: qualitative, quantitative, and mixed methods approaches* (Fifth ed.). Sage Publications.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage Publications.

Chuang, S. (2021). The applications of constructivist learning theory and social learning theory on adult continuous development. *Performance Improvement*, *60*(3), 6–14. https://doi.org/10.1002/pfi.21963

Dalton, B., Glennie, E., Studley, R., Wakentien, S., & Lauff, E. (2021). Do high school industry certifications reflect local labor market demand? An examination of Florida. *Career and Technical Education Research*, *46*(2), 3–22. https://doi.org/liberty.edu/10.5328/cter46.2.3

Dewey, J. (2018). *Democracy and education by john dewey* (2nd ed.). Myers Education Press.

Dicker, R., Garcia, M., Kelly, A., & Mulrooney, H. (2019). What does 'quality' in higher education mean? Perceptions of staff, students and employers. *Studies in Higher Education (Dorchester-on-Thames)*, *44*(8), 1425–1441. https://doi.org/10.1080/03075079.2018.1445987

Dougherty, S. M., & Harbaugh Macdonald, I. (2019). Can growth in the availability of stem technical education improve equality in participation?: Evidence from massachusetts. *Journal of Vocational Education & Training*, *72*(1), 47–70. https://doi.org/10.1080/13636820.2019.1578818

Dougherty, S. M., & Lombardi, A. R. (2016). From vocational education to career readiness: The ongoing work of linking education and the labor market. *Review of Research in Education*, *40*(1), 326–355. https://doi.org/10.3102/0091732x16678602

Eckert, J., & Butler, J. (2021). Teaching and leading for exemplary stem learning: A multiple-case study. *The Elementary School Journal*, *121*(4), 674–699. https://doi.org/10.1086/713976

Gallup, A. (2020). What adult educators need to know about apprenticeship: The resource for adult education. *COABE Journal*, *9*(1), 25–31. https://go.openathens.net/redirector/liberty.edu?url=https://www-proquest-com.ezproxy.liberty.edu/scholarly-journals/what-adult-educators-need-know-about/docview/2483040290/se-2

Garmston, R., & Wellman, B. (1994). Insights from constructivist learning theory. *Educational Leadership*, *51*(7), 83–84. https://www-proquest-com.ezproxy.liberty.edu/docview/224847505?pq-origsite=summon

Garrett, H. B. (2019). The influence of the completion agenda on decision making by community college career and technical education program deans. *Strategic Enrollment Management Quarterly*, *7*(3), 15–24. http://ezproxy.liberty.edu/login?qurl=https%3A%2F%2Fwww.proquest.com%2Fscholarly-journals%2Finfluence-completion-agenda-on-decision-making%2Fdocview%2F2606935707%2Fse-2%3Faccountid%3D12085

Gauthier, T. (2019). Exploring administrator perspectives of community college and career technical programs. *Career and Technical Education Research***,** *44*(1), 57–81. https://doi.org/10.5328/cter44.1.1

Gauthier, T. (2020a). A renewed examination of the stigma associated with community college career and technical education. *Community College Journal of Research and Practice***,** *44*(10-12), 870–884. https://doi.org/10.1080/10668926.2020.1758835

Gauthier, T. (2020b). Exploring employer perspectives of community college career and technical programs. *Career and Technical Education Research***,** *45*(1), 63–76. https://doi.org/10.5328/cter45.1.63

Gauthier, T. (2020c). Exploring the efficacy of post-secondary career and technical education industry advisory partnerships. *Journal of Vocational Education and Training*, 1–21. https://doi.org/10.1080/13636820.2021.1931944

Gauthier, T. (2020d). The value of microcredentials: The employer's perspective. *The Journal of Competency-Based Education*, *5*(2), n/a. https://doi.org/10.1002/cbe2.1209

Giani, M. S. (2019). Does vocational still imply tracking? Examining the evolution of career and technical education circular policy in Texas. *Educational Policy*, *33*(7), 1002–1046. https://doi.org/https://doi-org.ezproxy.liberty.edu/10.1177/0895904817745375

Granovskiy, B. (2018). *Reauthorization of the Perkins Act in the 115th Congress: The Strengthening Career and Technical Education for the 21st Century Act* (CRS Report R45446, Version 2) [Analysis]. Congressional Research Service. https://files.eric.ed.gov/fulltext/ED593627.pdf

Grubb, W. N. (1997). Not there yet: Prospects and problems for "education through occupations". *The Journal of Vocational Educational Research*, *22*(2), 1–23. https://web-p-ebscohost-com.ezproxy.liberty.edu/ehost/detail/detail?vid=0&sid=86ca9acc-d46c-4381-b824-1a706c35cfd6%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZzY29wZT1zaXRl#AN=507547477&db=ofm

Habib, K., Fusaomi, N., & Watanabe, K. (2021). Mechatronics: Experiential learning and the simulation of thinking skills. *Education Sciences*, *11*(2), 1–22. https://www.proquest.com/docview/2484145453/fulltextPDF/A467CDAD275049A4PQ/1?accountid=12085

Hasselquist, L., & Graves, N. A. (2020). CTE teacher retention: Lessons learned from mid-career teachers. *Career and Technical Education Research*, *45*(1), 3–15. https://doi.org/10.5328/cter45.1.3

Haviland, S., & Robbins, S. (2021). Career and technical education as a conduit for skilled technical careers: A targeted research review and framework for future research. *ETS Research Report Series*, *2021*(1), 1–42. https://doi.org/10.1002/ets2.12318

Hendricks, A., Myran, S., Katsioloudis, J. P., Owings, W., & Kaplan, L. (2021). Career and technical education industry credentials and its potential impact on a state's economy. *Journal of Applied Business and Economics*, *23*(8). https://doi.org/10.33423/jabe.v23i8.4870

Hendricks, A., Myran, S., Owings, W. A., Katsioloudis, P., & Kaplan, L. S. (2021). Rethinking the U.S. post-secondary education model: The relationship between earning career and technical industry credentials and the Virginia economy. *Journal of Education Finance*, *47*(2), 111–129. https://muse-jhu-edu.ezproxy.liberty.edu/article/846293/pdf

Hillage, J., & Pollard, E. (1998). *Employability: Developing a framework for policy analysis* (Research Brief No 85). Department for Education and Employment. https://scholar.google.com/scholar?q=related:rEmNcDsmz4UJ:scholar.google.com/&scioq=employability+developing+a+framework+for+policy+analysis&hl=en&as_sdt=0,1

Hodge, E., Dougherty, S., & Burris, C. (2020). *Tracking and the future of career and technical education: How efforts to connect school and work can avoid the past mistakes of vocational education* [Report]. National Education Policy Center. https://files.eric.ed.gov/fulltext/ED605784.pdf

Hollister, J. M., Spears, L. I., Mardis, M. A., Lee, J., McClure, C. R., & Liebman, E. (2017). Employers' perspectives on new information technology technicians' employability in north Florida. *Education and Training (London)*, *59*(9), 929–945. https://doi.org/10.1108/ET-02-2017-0019

Hora, M. T., & Lee, C. (2021). Does industry experience increase the teaching of "soft" skills in community college classrooms? *New Directions for Community Colleges*, *2021*(195), 65–79. https://doi.org/10.1002/cc.20467

Imperatore, C. (2020). Perkins V & high-quality cte. *Techniques*, *95*(2), 12–13. https://www-proquest-com.ezproxy.liberty.edu/docview/2449987408?pq-origsite=summon#

Jacobs, J., & Worth, J. (2019). *The evolving mission of workforce development in the community college* (CCRC Workin Paper No. 107). Community College Research Center. https://ccrc.tc.columbia.edu/media/k2/attachments/EvolvingMissionWorkforceDevelopment.pdf

Jafarinejad, S., Beckingham, L. E., Kathe, M., & Henderson, K. (2021). The renewable energy (RE) industry workforce needs: RE simulation and analysis tools teaching as an effective way to enhance undergraduate engineering students' learning. *Sustainability*, *13*(21), 1–16. https://doi.org/10.3390/su132111727

Johnson, J. L., Adkins, D., & Chauvin, S. (2019). A review of the quality indicators of rigor in qualitative research. *American Journal of Pharmaceutical Education*, *84*(1), 138–146. https://doi.org/10.5688/ajpe7120

Kandalec Holm, K. R. (2019). Perceptions of postsecondary career and technical education: A q method examination. *Career and Technical Education Research***,** *44*(1), 5–22. https://doi.org/10.5328/cter44.1.5

Kardel, A. (2021). Ensuring greater access to career pathways via registered apprenticeship. *Techniques*, *96*(4), 48–51. https://go.openathens.net/redirector/liberty.edu?url=https://www.proquest.com/trade-journals/ensuring-greater-access-career-pathways-via/docview/2637169308/se-2

Karimi, H., & Pina, A. (2021). Strategically addressing the soft skills gap among stem undergraduates. *Journal of Research in STEM Education*, *7*(1), 21–46. https://doi.org/10.51355/jstem.2021.99

Kett, J. F. (2017). “Theory run mad”: John Dewey and “real” vocational education. *The Journal of the Gilded Age and Progressive Era*, *16*(4), 500–514. https://doi.org/10.1017/s1537781417000366

Kim, E. H., Flack, C., Parham, K., & Wohlstetter, P. (2021). Equity in secondary career and technical education in the United States: A theoretical framework and systematic literature review. *Review of Educational Research*, *91*(3), 356–396. https://doi.org/10.3102/0034654321995243

Koehorst, M. M., van Deursen, A. J., Alexander, J. A., van Dijk, J., & de Hann, J. (2021). A systematic literature review of organizational factors influencing 21st-century skills. *SAGE Open*, *11*(4). https://doi.org/10.1177/21582440211067251

Kolb, A. Y., & Kolb, D. A. (2005). Learning styles and learning spaces: Enhancing experiential learning in higher education. *Academy of Management Learning & Education*, *4*(2), 193–212. https://doi.org/10.5465/amle.2005.17268566

Kolb, D. (1984). Experiential learning: Experience as the source of learning and development. *Journal of Business Ethics*, *1*, 20–38. https://www.researchgate.net/publication/235701029_Experiential_Learning_Experience_As_The_Source_Of_Learning_And_Development/citation/download

Lemon, L., & Hayes, J. (2020). Enhancing trustworthiness of qualitative findings: Using leximancer for qualitative data analysis triangulation. *The Qualitative Report*, 604–614. https://doi.org/10.46743/2160-3715/2020.4222

Lester, J., Cho, Y., & Lochmiller, C. R. (2020). Learning to do qualitative data analysis: A starting point. *Human Resource Development Review*, *19*(1), 94–106. https://doi.org/10.1177/1534484320903890

Lincoln, Y. S., & Guba, E. (1985). *Naturalistic inquiry* (1st ed.). SAGE Publications.

McComas, W. F., & Burgin, S. R. (2020). A critique of "stem" education: Revolution-in-the-making, passing fad or instructional imperative? *Science & Education*, *29*(4), 805–829. https://doi.org/liberty.edu/10.1007/s11191-020-00138-2

Malkus, N. (2019). *The evolution of career and technical education* (May) [Report]. American Enterprise Institute . https://www.aei.org/wp-content/uploads/2019/04/The-Evolution-of-Career-and-Technical-Education.pdf

McGunagle, D., & Zizka, L. (2020). Employability skills for 21st-century STEM students: employer's perspectives. *Higher Education, Skills and Work-Based Learning***,** *10*(3), 591–606. https://doi.org/10.1108/HESWBL-10-2019-0148

Michaels, C., & Barone, D. (2020). Career and technical education: Academic achievement as measured by national testing. *Career and Technical Educational Research***,** *45*(3), 3–19. https://doi.org/10.5328/cter45.3.3

Mindham, J., & Schultz, D. (2019). The impact of youth apprenticeship and employability skills programs on career & technical education concentrator-completer post graduation outcomes. *Career and Technical Education Research*, *44*(3), 3–14. https://doi.org/10.5328/cter44.3.3

Mohammadi, A., Grosskopf, K., & Killingsworth, J. (2020). An experiential online training approach for underrepresented engineering and technology students. *Education Sciences*, *10*(3), 1–13. https://doi.org/10.3390/educsci10030046

Morgan, H. (2022). Conducting a qualitative document analysis. *The Qualitative Report*, 64–77. https://doi.org/10.46743/2160-3715/2022.5044

Morris, T. H. (2020). Experiential learning: A systematic review and revision of Kolb's model. *Interactive Learning Environments*, *28*(8), 1064–1077. https://doi.org/10.1080/10494820.2019.1570279

Mthuli, S., Ruffin, F., & Singh, N. (2021). 'Define, explain, justify, apply' (deja): An analytic tool for guiding qualitative research sample size. *International Journal of Social Research Methodology*, 1–13. https://doi.org/10.1080/13645579.2021.1941646

O.Nyumba, T., Wilson, K., Derrick, C. J., & Mukherjee, N. (2018). The use of focus group discussion methodology: Insights from two decades of application in conservation. *Methods in Ecology and Evolution*, *9*(1), 20–32. https://doi.org/10.1111/2041-210x.12860

O'Banion, T. U. (2018). A brief history of workforce education in community colleges. *Community College Journal of Research and Practice*, *43*(3), 216–223. https://doi.org/10.1080/10668926.2018.1547668

Payne, B. (1906). How may manual training be made educative? *The School Review*, *14*(6), 425–428. https://doi.org/10.1086/434843

Plasman, J., Gottfried, M. A., & Hutt, E. L. (2020). Then and now: Depicting a changing national profle of stem career and technical education course takers. *Teachers College Record: The Voice of Scholarship in Education*, *122*(2), 1–28. https://doi.org/10.1177/016146812012200209

Prebil, M., & McCarthy, M. (2018). *Building better degrees using industry certifications: Lessons from the field* (Report). New America. https://files.eric.ed.gov/fulltext/ED590764.pdf

Qualitative dissertation template. (n.d.). SOE doctoral community. https://canvas.liberty.edu/courses/37488/pages/dissertation-templates?module_item_id=3665987

Rebele, J. E., & St. Pierre, E. (2019). A commentary on learning objectives for accounting education programs: The importance of soft skills and technical knowledge. *Journal of Accounting Education*, *48*, 71–79. https://doi.org/10.1016/j.jaccedu.2019.07.002

Roberts, R. E. (2020). Qualitative interview questions: Guidance for novice researchers. *The Qualitative Report*, *25*(9), 3185–3203. https://go.openathens.net/redirector/liberty.edu?url=https://www.proquest.com/scholarly-journals/qualitative-interview-questions-guidance-novice/docview/2445581779/se-2

Roehrig, G. H., Dare, E. A., Ring-Whalen, E., & Wieselmann, J. R. (2021). Understanding coherence and integration in integrated STEM curriculum. *International Journal of STEM Education*, *8*(1), 1–21. https://doi.org/10.1186/s40594-020-00259-8

Rojewski, J. W. (2002). Preparing the workforce of tomorrow: A conceptual framework for career and technical education. *Journal of Vocational Education Research*, *27*(1), 7–35. https://doi.org/10.5328/jver27.1.7

Russell, R., & White, M. C. (2020). *Perceptions of career and technical education in Missouri: Findings from the department of elementary and secondary educations cte survey*. Missouri: Institute of Public Policy. https://truman.missouri.edu/sites/default/files/publication/white-paper-perceptions-of-career-and-technical-education-in-missouri-w.pdf

Schunk, D. (2020). *Learning theories: An educational perspective* (8th ed.). Pearson.

Shaw, S. T., Spink, K., & Chin-Newman, C. (2019). "Do I really belong here?": The stigma of being a community college transfer student. *Community College Journal of Research and Practice*, *43*(9), 657–660. https://doi.org/10.1080/10668926.2018.1528907

Snell, D. (2019). Vocational education and the revitalisation of manufacturing in the United States. *Journal of Vocational Education & Training*, *71*(2), 239–259. https://doi.org/10.1080/13636820.2018.1480520

Stahl, N. A., & King, J. R. (2020). Expanding approaches for research: understanding and using trustworthiness in qualitative research. *Journal of Developmental Education*, *44*(1), 26–29. https://go.openathens.net/redirector/liberty.edu?url=https://www.proquest.com/scholarly-journals/expanding-approaches-research-understanding-using/docview/2467348904/se-2

Sublett, C., & Griffith, D. (2019). *How aligned is career and technical education to local labor markets?* [Report]. The Thomas B. Fordham Foundation. https://files.eric.ed.gov/fulltext/ED598867.pdf

Sublett, C., & Tovar, J. (2021). Community college career and technical education and labor market projections: A national study of alignment. *Community College Review*, *49*(2), 177–201. https://doi.org/10.1177/0091552120982008

Sweetland, S. R. (1996). Human capital theory: Foundations of a field of inquiry. *Review of Educational Research*, *66*(3), 341–359. https://doi.org/10.3102/00346543066003341

The Office of Alabama Governor. (2019, July 2). *Governor Ivey moves Alabama's workforce development efforts forward* [Press release]. State of Alabama. https://doi.org/https://governor.alabama.gov/newsroom/2019/07/governor-ivey-moves-alabamas-workforce-development-efforts-forward/

The White House. (2016, February 11). *STEM for all* [Press release]. https://obamawhitehouse.archives.gov/blog/2016/02/11/stem-all

Threeton, M. D. (2021). An exploration of experiential learning practices utilized by STEM educators. *Experiential Learning & Teaching in Higher Education*, *3*(3), 43–48. https://nsuworks.nova.edu/cgi/viewcontent.cgi?article=1058&context=elthe/

Tomaszewski, L., Zarestky, J., & Gonzalez, E. (2020). Planning qualitative research: Design and decision making for new researchers. *International Journal of Qualitative Methods*, *19*, 1–7. https://doi.org/10.1177/1609406920967174

Tucker, S., & Hughes, A. (2020). Endorsement of career and technical education: Phenomena influencing core-subject teacher perceptions. *Journal of Technology Education*, *31*(2), 40–55. https://doi.org/10.21061/jte.v31i2.a.3

United States Department of Labor. (n.d.). *Safety enforcement*. https://www.osha.gov/enforcement. https://www.osha.gov/

U.S. Department of Education. (n.d.). *Science, technology, engineering, and math, including computer science*. STEM. https://www.ed.gov/stem

U.S Department of Labor. (1991). *What work requires of schools: A SCANS report for America 2000*. U.S Government. https://wdr.doleta.gov/scans/whatwork/

United States Government. (n.d.). *Apprenticeship fact sheet*. Apprenticeship USA. https://www.apprenticeship.gov/

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press. https://books.google.com/books?hl=en&lr=&id=RxjjUefze_oC&oi=fnd&pg=PA1&dq=

mind+and+society+vygotsky+1978&ots=ojzYRYu0co&sig=1DT0wVO1d3WyGCMQOL0wktg1I8c#v=onepage&q=mind%20and%20society%20vygotsky%201978&f=false

Wagner, B., Zhu, X., & Wang, X. (2021). Tools in their toolbox: How community college faculty transfer industry experience into their teaching. *Community College Review*, *49*(4), 483–505. https://doi.org/10.1177/00915521211026677

Wraga, W. (2019). The pragmatic progressives. *American Educational History Journal*, *46*(2), 111–129. https://go.openathens.net/redirector/liberty.edu?url=https://www.proquest.com/scholarly-journals/pragmatic-progressives/docview/2279771945/se-2

Wrye, B., Chafin, C., & Higginbotham, C. (2019). Creating a win-win: Designing and implementing mutually beneficial collaborations between community college organizations and academic programs. *Education and Training***,** *61*(5), 605–621. https://doi.org/10.1108/ET-01-2018-0011

Xue, X., Garza, T., & Huerta, M. (2019). Factors influencing high school students' career and technical education enrollment patterns. *Career and Technical Education Research***,** *44*(3), 53–70. https://doi.org/10.5328/cter44.3.53

Zirkle, C., Jeffery, J., & Shrewe, L. (2019). A longitudinal study of alternatively licensed career and technical teachers. *Career and Technical Education Research*, *44*(1), 23–47. https://doi.org/10.5328/cter44.1.23

Appendix A

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

January 12, 2023

Todd Freshwater
Susan Stanley

Re: IRB Exemption - IRB-FY22-23-566 Employers' Experiences with Graduates of Industrial Systems Technology Community College Programs in Northeast Alabama

Dear Todd Freshwater, Susan Stanley,

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under the following exemption category, which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:104(d):

Category 2.(iii). Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met:
The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by §46.111(a)(7).

Your stamped consent form(s) and final versions of your study documents can be found under the Attachments tab within the Submission Details section of your study on Cayuse IRB. Your stamped consent form(s) should be copied and used to gain the consent of your research participants. If you plan to provide your consent information electronically, the contents of the attached consent document(s) should be made available without alteration.

Please note that this exemption only applies to your current research application, and any modifications to your protocol must be reported to the Liberty University IRB for verification of continued exemption status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this exemption or need assistance in determining whether possible modifications to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,
G. Michele Baker, MA, CIP
Administrative Chair of Institutional Research
Research Ethics Office

Appendix B

Consent

Title of the Project: Employers' Experiences with Graduates of Industrial Systems Technology Community College Programs in Northeast Alabama
Principal Investigator: Todd Freshwater, Doctoral Candidate, Liberty University

Invitation to be Part of a Research Study

You are invited to participate in a research study. To participate, you must be employed in the industrial or manufacturing field and responsible for the hiring, supervising, and evaluating of Industrial Systems Technology graduates or graduates of a comparable program. Participants must be at least 21 years of age, have been in a technical, supervisory position for at least two years, and should have an Associate of Applied Science degree in a related field or at least five years of practical, technical experience. Taking part in this research project is voluntary.

Please take time to read this entire form and ask questions before deciding whether to take part in this research.

What is the study about and why is it being done?

The purpose of the study is to better understand if the skills being taught in Industrial Systems Technology courses, or equivalent courses offered by community colleges, align with skills needed by those companies that employ Industrial Systems Technology graduates. The purpose of my research is to discover how employers describe their experiences with graduates of Industrial Systems Technology and equivalent programs.

What will happen if you take part in this study?

If you agree to be in this study, I will ask you to do the following things:

1. Personal Interview. The interview will take approximately 45-60 minutes to complete and will be recorded with a digital recording device.
2. Focus Group. The focus group will take approximately 45-60 minutes to complete and will be recorded with a digital recording device.
3. Transcript Review. The participant will also be asked to verify a transcript of their interview for accuracy.
4. Documents will be requested from your employer's human resource department. Documents will include items such as job descriptions, education requirements, and work responsibilities. Documents will not include private information about employees.

How could you or others benefit from this study?

Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society include improved training for community college technical students, and improved work skills for graduates of community college technical programs.

What risks might you experience from being in this study?

The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

How will personal information be protected?

The records of this study will be kept private. Published reports will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records.

- Participant responses will be kept confidential through the use of pseudonyms. Interviews will be conducted in a location where others will not easily overhear the conversation.
- Data will be stored on a password-locked computer and/or locked safe and may be used in future presentations. After three years, all electronic records will be deleted and hard copies will be shredded.
- Interviews/focus groups will be recorded and transcribed. Recordings will be stored on a password locked computer and/or locked safe for three years and then erased. Only the researcher will have access to these recordings.
- Confidentiality cannot be guaranteed in focus group settings. While discouraged, other members of the focus group may share what was discussed with persons outside of the group.

How will you be compensated for being part of the study?

Participants not be compensated for participating in this study.

Is study participation voluntary?

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

What should you do if you decide to withdraw from the study?

If you choose to withdraw from the study, please contact the researcher at the email address/phone number included in the next paragraph. Should you choose to withdraw, data collected from you, apart from focus group data, will be destroyed immediately and will not be included in this study. Focus group data will not be destroyed, but your contributions to the focus group will not be included in the study if you choose to withdraw.

Whom do you contact if you have questions or concerns about the study?

The researcher conducting this study is Todd Freshwater You may ask any questions you have now. If you have questions later, **you are encouraged** to contact him a and/or You may also contact the researcher's faculty sponsor, Dr. Susan Stanley, at

Whom do you contact if you have questions about your rights as a research participant?

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515 or email at irb@liberty.edu.

Disclaimer: The Institutional Review Board (IRB) is tasked with ensuring that human subjects research will be conducted in an ethical manner as defined and required by federal regulations. The topics covered and viewpoints expressed or alluded to by student and faculty researchers are those of the researchers and do not necessarily reflect the official policies or positions of Liberty University.

Your Consent

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. You will be given a copy of this document for your records. The researcher will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

☐ The researcher has my permission to audio-record me as part of my participation in this study.

_____
Printed Subject Name

_____
Signature & Date

Appendix C

Study Participant Screening Questions

Name: _____ Date: _____ Time: _____
Company Name: _____ Position: _____
Contact Information: _____ Age: _____
Education: _____
Years in Position: _____ Years of Experience in a Technical Field: _____

Questions:

1. Do you directly supervise employees that are graduates of an Industrial Systems Technology community college program? Y/N
2. Have you been a supervisor for at least two years? Y/N
3. Do you hold a degree in the field? Y/N
4. Have you obtained an Associate of Applied Science degree in Industrial Systems Technology or a related field within the last 12 months? Y/N
5. Have you been transferred to your current position within the last 6 months? Y/N
6. Are you over the age of 21? Y/N

Notes:

Eligible for Study? Y/N